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## ORIGINAL ARTICLES

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### PALEONTOLOGIC DEVELOPMENT OF THE SKULL AND TEETH\*†

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PALÆONTOLOGY is that branch of the science of geology which studies the life of past ages. The tangible subject matter is the remains and traces of ancient animals preserved in the rocks. These animals are the ancestors of those living today, and their study leads to a better understanding of the origin of physical features. There is a definite relationship between paleontology and dentistry. Anomalies of the human teeth and jaws, particularly those anomalies of a degenerative nature, often resemble the normal of some extinct ancestor. The early stages in the formation of the teeth and jaws of an individual are a repetition of the changes through which the race has passed. Beyond any practical value, there is the historical interest of knowing whence came the human teeth and jaws.

One great advantage in studying life from the paleontologic viewpoint is the ability to find the time a type first appeared and when it lived in regard to other types. The rocks of the earth's crust are arranged in layers, each of which is successively younger than the bed below, and the animals found in these layers are of the same scale of antiquity. The oldest rocks we know are one billion, seven hundred twenty million years old, and the rocks of the first billion years of geologic time contain only simple forms of animals. Extensive animal life is found in rocks deposited five hundred million years ago, but no vertebrate animals have as yet appeared. All vertebrate, or backboned animals, are confined to the last four hundred and fifty million years.

The simplest vertebrate known is *Paleospondylus*, a form related to the living lamprey. The skeleton is of cartilage. The primitive skull, or chon-

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drocranium, consists of paired olfactory capsules, optic capsules, and otic capsules and a flimsy, incomplete brain case. Back of the head are seven pairs of gills supported on seven pairs of cartilage gill arches. The animal has no mandible.

The descendants of this animal are sharks of simple extinct types. In the process of change, the first pair of gill arches has lost its gills and has moved forward to become the mandible. The second or hyoid pair of gill arches moved forward to form the articulation of the mandible to the brain case. The skin is covered with placoid scales, which are composed of a dentine core and an enamel cap. These are the beginnings of the human teeth. In the development of all vertebrates, the lining of the mouth is formed by infolding of the skin. This infolding carries the placoid scales into the oral cavity, where they differentiate into teeth. The teeth of primitive sharks are low cones attached to the jaw by connective tissue. As teeth are broken off, they are replaced from below in infinite succession.

From the shark, a new type of fish, the ganoid, developed. The changes at this stage are important. Bony plates were formed in the dermis of the head, and these plates settled down over the chondrocranium and cartilaginous mandible. The conical teeth were held in place by the margins of these bones. A complete brain case of many elements, including opercular elements protecting the gills, was formed, and the mandible was sheathed by about ten separate bones. From this condition to man, there is a regular reduction in the number of these elements. No new ones are added.

About three hundred million years ago the continents were uplifted, and the fresh water bodies in which the ganoids lived were much reduced in area. Overcrowding with attendant increase in competition resulted. One type of ganoid found it possible to solve the problem by living on the shore, changing the air bladder into a lung and gradually reducing the fins to feet. The skull was strengthened and simplified by loss of the opercular elements. The group of animals resulting from these changes is the amphibia, represented today by frogs and salamanders. The primitive forms had a third, or pineal, eye in the center of the skull roof. Notches in the back of the skull housed the auditory apparatus.

Since the amphibia must lay their eggs in water, their range is restricted to areas near permanent water bodies. From the amphibians, the reptiles developed by a gradual series of progressions. They could lay their eggs in the open air. The reptiles specialized into an enormous variety of types, swimming, flying, leaping, crawling, and walking. All of them had a quadrate bone developed from the hyoid gill arch plus certain dermal bones to hinge the mandible to the brain case. The more progressive types lost the three pairs of temporal bones, which formed the portion of the sides of the skull behind the orbits. In all simpler animals, the external nares opened directly into the oral cavity, a condition which prevented breathing when the mouth was grasping an object. The progressive reptiles developed a series of extra bones in the roof of the mouth and formed a passage from the external nares directly to the throat. This is called the false palate, or in man, the hard palate.

One of the groups of these progressive reptiles, the therapsids, is our ancestor. The dentary element of the mandible became larger and grew upward to touch the brain case. The other elements and the quadrate bone disappeared, leaving only the dentary bone articulating directly with the squamosal bone of the skull. The teeth are high cones implanted in sockets. The canines are distinctly larger and divide the dentition into incisors and molars. The molar series gradually changed into one in which each tooth consisted of three cusps in a row. These three cusps rotated into triangles, the trituberculate type, the apex of the triangle inward in the maxilla, outward in the mandible, so that the triangles bite past one another and give an occlusion between teeth. From our knowledge of living animals, we conclude that the group has acquired warm blood, hair, and mammary glands, and is a true mammal, distantly related to the modern opossum. A change not shown in fossil forms, but which must have occurred at this time, is the change from infinitely successional teeth to the two sets of mammals. An intermediate stage in which there may be four sets seems to be present in some forms.

The mammal appeared about one hundred and fifty million years ago. The teeth early developed roots and crowns and were closely embraced by the bones of the jaws. In the vacant corner of the triangle of cusps in the mandible, a fourth cusp arose and occlusion between cusps first appeared. The tooth attained a divided root. The animal group which possessed these characteristics is represented today by shrews, and is called the Insectivora. The primitive members of this group probably are the ancestors of all the highly specialized types of mammals of the last ten million years. This includes the ungulates, which have high-crowned, almost rootless teeth that continue to grow until old age; the elephants, whose three sets of molars come in from behind; the rodents, whose incisors are of continuous growth; and the whales and anteaters who have no teeth at all.

The Insectivora are certainly the ancestors of the group to which man belongs, the Primates. The oldest member of this group was found in Wyoming in rocks fifty million years old. It is a relative of the living lemurs. From the forty-four teeth of the insectivores, forty are left. The maxillary bone is an important part of the side of the face and enters into the formation of the orbit. The teeth are low-crowned and primitive, but are now separated into incisors, canines, premolars, and molars. The animal is arboreal and possesses opposable thumbs and big toes. It is likely that the dexterity made possible by the grasping power attained is largely responsible for the increasing thinking power of the brain.

Some ten million years ago, the lemurs gave rise to a new group, the ancestors of the apes and monkeys. The monkeys stayed in the trees and specialized for an arboreal life. The ape type began to live on the ground and gradually assumed an upright posture. In becoming upright, the head rotates on the end of the spine from the original articulation at the back of the skull to an articulation on the bottom of the skull. The parietal bones broaden and elongate to cover the back of the skull and the foramen magnum moves to the under side of the head.

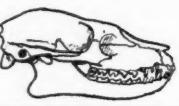
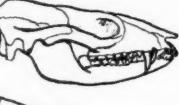
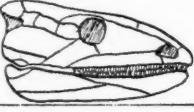
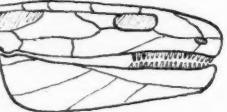
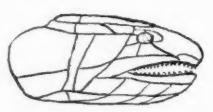
Recent 1,000,000 years	Modern	man		
	Piltdown man	Java man		Thirty-two teeth Erect posture Large canines
Cenozoic Age of Mammals 20,000,000 yrs	monkeys specialized mammals	apes tarsiers lemurs		Occlusion between cusps Forty teeth Opposable thumb
Mesozoic Age of Reptiles 150,000,000 yrs	marsupials birds	insectivores cynodonts primitive reptiles	  	Direct articulation Trituberculate teeth Mandible of 1 piece  Large dentary bone Teeth differentiated Intertemporals lost  Air type egg Quadrate articulation
Upper Paleozoic Age of Fishes 300,000,000	amphibia ganoids	bony fish sharks aberrant sharks	  	Paired legs Opercular bones lost Auditory notch  Dermal skull bones Teeth held by bones Ray type fin  Teeth from placoids Jaws and paired fins Hyoid articulation Five branchial arches
Lower Paleozoic 500,000,000	cyclostomes			Cartilage skeleton No jaws or paired fins Seven branchial arches

Fig. 1.—From top to bottom the figures are: Chimpanzee (from Lull after Mivart); fossil lemur (after Gregory); primitive mammal; advanced reptile (after Broom); primitive amphibian (modified from Watson); crossopterygian fish (modified from Traquair); chondrocranium and gill arches of shark; *Paleospondylus*, a fossil lamprey (after Traquair).

About one million years ago, the ape group divided into two lines; one line becoming more powerful and depending upon strength and ferocity for protection, the other line specializing particularly in the direction of increased intelligence. This last type is ancestral man. The dentition is reduced to thirty-two elements and is well developed for an omnivorous diet. Fossil representatives are fairly numerous. Probably the most ancient fossil in the direct line to modern man is the recently discovered Peiping man. The brain is about half the size of that of modern man, the skull bones are thick, and the eyes are overhung by massive supraorbital crests. The mandible and the teeth are not known, and for an example of this part of ancient man the Heidelberg fossil is typical. The jaw is massive and bears a heavy posterior ramus, the canines are large and the third molar is of full equality to the other molars. The series of fossil forms showing the stages to modern man exhibit a regular progression in the same direction. The brain continuously increases in size, the skull bones become lighter, but fused together tightly, the supraorbital crest is almost lost, the posterior ramus of the jaw is smaller than the anterior ramus, the canines are reduced to unimportance, the third molars become nonfunctional or even fail to erupt, and the face becomes nearly vertical.

Man of today is the culmination of a long series of changes which we can trace for five hundred million years. From the placoid scale of the primitive shark to our teeth the genealogy is known. In regard to our skull and jaws, we are highly specialized, but in regard to our teeth, we have not progressed much from those of primitive insectivorous mammals. For a mammal, we are primitive except in the size and intellectual power of our brain.

#### DISCUSSION

*Dr. M. R. Lebow, Providence, R. I.*—An old story relates that one of the reasons God created mountains was for man to climb to their tops and realize how small man really was and how large the world beyond. For only by seeing himself in relation to his surroundings could man view himself in the proper perspective. Similarly, the dentist, whose whole attention is concentrated upon teeth, must step out into broader and interrelated fields, in order that he may see his own specialty in its proper perspective.

The way to obtain a better understanding of teeth is not only to keep on studying more and more about teeth, but also to study more and more the relationship of teeth to man's general physiologic development. For teeth are not an independent growth; they are only one manifestation of man's general development.

It is just this that Dr. Branson has so clearly expounded this evening. He has taken us to the top of the mountain and shown us the relationship between our own specialty and the allied field of paleontology. He has traced the paleontologic development of the skull and teeth, so that we can see the essential bearing that this historical background has upon our specialized field of practice.

Paleontology is a study of the past history of this globe. That past history is determined by animal remains which are found in various strata of the earth's crust. These remains consist mostly of skeletons, parts of skeletons, teeth, or fragments of bone, which through geologic ages, have become either preserved, or fossilized.

The geologist and paleontologist have built a continuous record, by means of which they can tell a connecting story of life existing on this globe in various forms, for hundreds of millions of years.

Great changes took place in the development of life during these prehistoric eras. Various forms of life which existed for long periods, and which, in some cases, dominated the life of their times, became completely extinguished, and the fossil remains are the only evidence we have of their past existence.

Whereas the geologist and paleontologist specialize in this past history, we, as doctors, specializing in the cure of human ailments, should be interested in the study of these changes in order that we may derive valuable data which will help us to trace back the causes and effects of human ailments. Let us briefly review some of this historical evidence which Dr. Branson has mentioned.

Among the lower forms, we first find the skull as a cartilaginous structure. This is later replaced by a large number of bones—a far larger number than we find in man or any other mammal.

As we ascend to higher forms, however, we find a constant decrease in the number of skull bones. Some of the bones have merged to form the occipital; others have united to make up the auditory capsule; and the mandible which consisted of six bones is now one.

The reason that we find less bones in the skull of higher forms is due to the fact that a larger brain required a better protective cap or covering, a protection which small individualized bones could not furnish.

So much for the development of the skull; now let us go back again and briefly trace some of the stages in the development of the teeth as shown by Dr. Branson.

One of the first chordates to possess teeth, was the primitive lamprey, or *eyelostome*. It had no jaws, but had teeth in the buccal funnel and on the tongue.

In the next stage, we find the elasmobranch, or primitive shark, with jaws; his body was covered with an armor called placoid or "shagreen scales," which composes the exoskeleton.

Each of these scales has the same structure as a tooth, being composed of dentine, capped with an enamel layer and supported on a base resembling the bony cement or *crusta petrosa* of the tooth. These placoid scales are infolded into the oral cavity, and are used as teeth.

Passing over the characteristic teeth of the fish, amphibians, and the reptiles, we now come to the mammalian stage. The mammalian dentition shows a great variety of forms. The single cones of the early reptiles have become fused, and they form the premolars and molars.

For example, the lion and tiger, or animals of that type, are provided with a special carnassial tooth. This is a back tooth with an elongated blade, with the opposing tooth, it forms and functions as shears.

The beaver is provided with two special incisors. This animal lives on roots, and the incisors necessarily receive rough usage. Nature, has, therefore, provided him with persistently growing incisors.

The plant-eating or herbivorous animals are provided with lophodont teeth, or teeth with broad crowns in a variety of patterns.

Now let us turn to early man. The first record, called *Pithecanthropus*, consists of a skullcap, one molar tooth, one incisor and a femur. The reconstruction of these remains reveals an individual with a protruding face and very prominent supraorbital ridges, and a brain capacity larger than that of any ape but much smaller than that of modern man.

The next records, which are those of the Heidelberg, Piltdown, Neanderthal and Cro-Magnon man, show a gradual increase in the size of the brain and a reduction of the facial muzzle. The occlusion is edge to edge. Some primitive natives of Tasmania still have this edge to edge occlusion. From there on until we reach *Homo Sapiens*, or modern man, the face becomes more vertical and the forward movement of the brain is continuous.

In summing up the changes which have taken place in the skull and teeth from the lower to the higher forms, we must ask ourselves these questions: (1) Why the large number of bones in the lower forms? (2) And also why the more complicated tooth structure in higher forms? There is only one possible answer: the bone structure and tooth structure have followed the law of *use and non-use*. The law of use and non-use can especially be appreciated by the dentist.

Every dentist can tell which side of the mouth his patient uses the most. On the side which is most used, the teeth are healthy and clean; the gums are firm and pink. On the side which is not used, the opposite condition exists. The teeth are not clean; deposits have formed all around the teeth; and the gums are pale and tend toward gingivitis.

The orthodontist has an exceptional opportunity of seeing conditions caused by non-use. A great percentage of his patients have malformed mouths and faces, particularly the mouth breathers. Their mouths are always open, and their muscles are out of tone and seem to hang on very much like a curtain.

Absent teeth in the human dentition are not infrequent. Every dentist has seen mouths with missing laterals, canines and premolars; but I have yet to see missing first or second molars. The reason is evident; the incisors are little used, whereas the molars are used.

In this modern civilization of the knife, fork and prepared foods, some of the human teeth have lost their use and function. Nature is making no exception with us in her law of non-use and is simply trying to get rid of teeth in the human mouth, which have lost their function.

We have many examples of disintegration, caused by non-use in the study of paleontology. An outstanding example is the whale, which lost its entire dentition because of its change of habitat, from land to water.

Before concluding, let us consider one outstanding point in the immediate practical application derived from the study of paleontology. Paleontology teaches us that nothing remains fixed and that changes are constantly and continually going on, even in the short lifetime of an individual. Therefore, in the construction of artificial appliances, these inevitable changes must be taken into consideration by the dentist; the same as the engineer takes into consideration the physical changes which his material must undergo under varying future conditions.

In conclusion, let me say that a study of paleontology would be of great benefit to the man who is looking for the "cause" beyond the human mouth. The dental profession may solve the problem of caries; the orthodontist may solve his problems by preventing deformities. All of this cannot be done by one individual. Cooperative study by biochemists, trained observers from the medicodental field, in cooperation with that group of paleontologists, anatomists, naturalists, archeologists and anthropologists, should bring forth results, which the individual worker alone can never hope to accomplish.

*Dr. John C. Normand, Providence, R. I.*—There is no doubt but that the teeth are the most durable tissues of the entire body. You will remember that Dr. Branson told us that after the shark group came the ganoid fishes and that they had an entirely new type of scales. There seems to be no doubt, then, that teeth should be regarded as scales which have migrated into the mouth. One of the ganoid fishes is the present-day sturgeon. In the case of the sturgeon there are no teeth at all. The hake, for example, has a hinged-like arrangement for the support of the teeth; these bend backward during the passage of the prey but are re-erected by elastic ligaments.

As a rule the dentine of the ganoid fishes is osteodentine in character, but this is not invariable.

Dr. Branson also told us that certain of the ganoids learned to get about on land and later became amphibians, of which the salamander is the living representative.

In the amphibians the teeth are much less numerous than in the fishes. The toad, for example, is edentulous, while the frog has no teeth in the mandible. Amphibians' teeth are usually ankylosed to the jaw.

In the reptiles a great many various arrangements of the teeth are found. The turtle, for example is edentulous, although the ectodermal growth from which the teeth are developed is present in the embryonic stage.

In the nonpoisonous snakes there are two rows of teeth, one in the maxilla and the other in the palatine and pterygoid bones. In the mandible there is only one row. The teeth are ankylosed so strongly to the bone that one of these snakes would be unable even if it wished to, to let any prey escape from the mouth.

The poisonous snakes have a special poison fang running down through the maxilla one on each side, which transmits poison from the poison gland. In snakes such as the cobra, the tooth is always erect, but in snakes such as are found in our country, for example the rattlesnake and the adder, there is a peculiar mechanical arrangement by which the tooth is erected when the jaws open for striking which at other times lies flat in the mouth.

Birds are edentulous but paleontology shows that their teeth were reptilian in character.

In all these lower vertebrates, then, the teeth are similar or nearly similar in character; at least they are not divided into definite incisor, canine, premolar and molar regions. Their dentition is therefore known as "homodont." Another characteristic is that in almost all of them there is an arrangement for a continuous succession of teeth, so that when one is lost another from behind takes its place, and to this arrangement the term "polyphyodont" is applied. With a few exceptions a homodont dentition is also polyphyodont.

In front of the premolar teeth and back of the canine there is often a place called the diastema, and this is the familiar place where, in the horse, the bite lies.

There is a great deal of discussion as to how the complex back teeth of mammals with their numerous cusps were derived from the simple conical teeth which are generally assumed to have been the primitive arrangement.

The most acceptable theory at present, seems to be the one which Dr. Branson spoke of as the "tritubercular" theory. This is largely the work of American paleontologic research. According to this theory, the surface of the tooth at this stage of its development has a triangular shape with a cone at each angle. This is of very common occurrence among ancestral mammals. Other cusps may develop later, and so the four cusp and the five cusp molar teeth of man and other mammals are accounted for.

Some of these forms are not unlike the so-called "inverted cusp" tooth which is on the market at the present time.

Mammalian odontology is generally well explained by paleontology, but the more one searches in this line the more one finds evidences of arrested development in phylogeny or retrogressed phylogeny.

What causes the eruption of teeth? The growth of the roots is not of itself enough to account for it. Do you think that possibly the question of blood pressure may be a determining cause?

There is a curious relationship and a more or less constant one between the dental formulas of men and mammals. For example:

Man has 2 incisors, 1 canine, 2 premolars, 3 molars	(maxilla)
2 incisors, 1 canine, 2 premolars, 3 molars	(mandible)
Let us call this in this fashion	2-1-2-3
	2-1-2-3
Old world monkey has a formula exactly like man.	
The lemur also has the same formula as man.	
The new world monkey has the formula	2-1-3-3
	2-1-3-3
The insectivorous bats	2-1-2-3
	3-1-3-3
The hedgehog	3-1-3-3
	2-1-2-3
The mole	3-1-4-3
	3-1-4-3
The cat	3-1-3-1
	3-1-2-1
The dog	3-1-4-2
	3-1-4-3
The bear	Same as dog
The raccoon	3-1-4-2
	3-1-4-2

The hyena	3-1-4-1
	3-1-3-1
The seal	3-1-4-1
	3-1-4-1
The hippopotamus	2-1-4-3
	2-1-4-3
The pig	3-1-4-3
	3-1-4-3
The horse	3-1-3-3
	3-1-3-3

These are some few thoughts I wish to leave with you in closing, and I wish to thank you for your attention and to assure you that the very limited studies that I have made along this line have been most interesting.

*Dr. Raymond L. Webster, Providence, R. I.*—The subject of the paleontologic development of the head and teeth is most interesting and instructive and offers a wealth of knowledge which we may "hook up" with our everyday problems for practical use.

In the few remaining moments allotted to me I shall mention a few points to illustrate this which points have been noted in recent investigations by T. Wingate Todd of England, now working at the Western Reserve University at Cleveland, Ohio.

We hear considerable about the degenerating changes of the human dentition, and without giving too much thought to the subject we accept these observations, such as the erratic character, size and sometimes absence of the maxillary third molar, the malformed or missing maxillary lateral incisors, as well as the frequent condition of caries of the first permanent molar, as evidences of such.

When asked by our patient why such conditions exist, are we not often wont to pass it off by placing the blame on modern civilization? Prehistoric man was not bothered with such conditions, we say, and let it go at that. But was he not? What do the investigators say? Dr. Todd says that these examples were sometimes present in the very earliest existence of man. He says that we must not lose sight of the fact that the past generation or so has shown clearly the effects of urbanization before the adequate development of public health and social hygiene. However, he sees no evidence that such a condition indicates the degenerating process going on continuously in the modern human jaw. He even predicts that we should find no such occlusal defects in the generation which is now growing up, whose teeth have been so closely looked after during the school period.

In the case of the anomalies of the third molar we hardly find the mandibular third molar suffering any change in size to any marked degree. It may be absent, but it is the maxillary third molar that does, and is sometimes a mere stump tooth and, says Todd, this is not really a wisdom tooth at all but a para-molar which has come into position through the absence of the first molar tooth. It is characteristic of most mammals and certainly the most primitive ones that the last tooth in the row is the smallest especially in the maxilla. This is due to alternate occlusion in the pattern in other mammals as in man, and the last maxillary molar occludes with the distal part of the last mandibular molar. It is only in animals that have secondarily increased the size of their last molar tooth that he finds the condition so evident, assumed to be the primitive one, in such animals as the elephant, pig and sometimes the baboon and gorilla.

Now for the maxillary lateral incisor, we find that anomalies in shape or presence of this tooth are due to its close proximity to the suture of the premaxilla and the maxilla proper and its dental rudiment may be split.

Coming back for a moment to the gorilla which I mentioned as having progressively larger molars from before backward, the explanation given for this is that it is a known fact that changes in dentition go hand in hand with changes of shape of fixation or fitting of the jaw into the face. The anthropoid pattern has developed through secondary enlargement of the second and third molars with the elongation of the jaws, while in man the first molar is the largest because of the maintenance of the short jaws.

As a further proof that evolution has not brought so many changes for man and that there is no reason to indicate a devolution of the teeth of man of today, three specimens of the stone age were examined, which include the type known as the Neanderthal, the Heidelberg man, and the man from Rhodesia. These date back between 35,000 to 45,000 years ago and even in these, which present some characteristics of man's dentition of today, we find the same type of caries, wear of the teeth similar, first molar the largest, third molar smallest and crowded condition of the mandibular incisors. We are shown, therefore, that since early glacial times the type of dentition has been an accomplished fact, and features which are supposed to indicate devolution of the teeth of man today were also present in the earliest existence, namely the small size of the third molar, small size of the canine tooth, crowding of the mandibular incisors, larger size of the first molar and its special liability to caries.

## THE ETIOLOGY AND TREATMENT OF ABNORMALLY ROTATED MOLARS\*

By K. C. SMYTH, L.D.S., R.C.S., ENGLAND

### INTRODUCTORY

MY REASONS for choosing "The Etiology and Treatment of Abnormally Rotated Molars" as the subject of this paper are two. First, the departure from the normal position and occlusion which is described as abnormal rotation is so small in terms of millimeters that it is an irregularity which is often overlooked. Thus the recognition of the importance of the diagnosis and treatment of rotations is not as widespread as it deserves to be. I think this is also due to the fact that the cases which come up for treatment have almost always much more marked symptoms demanding attention, and there is so much to be done that a relatively small abnormality escapes notice, or, if observed, is dismissed as unimportant. Second, it is hoped to show that abnormal rotations of molars, as they will be described, have a definitely harmful effect on the occlusion of each case, even if small in actual dimensions; and, conversely, that correction of the abnormality results in a correspondingly definite improvement in occlusal relations.

I believe the first reference in dental literature to abnormal rotation was Hellman's,<sup>1</sup> in which he shows that this condition of the maxillary first permanent molars leads to confusion in classification. He states that in 800 cases examined there was a very high percentage of rotations of maxillary molars, and he illustrates a case where rotation of one maxillary permanent molar is associated with an apparent postnormal relationship of the mandibular teeth. The lingual relationships are also well shown. Mr. J. G. Turner,<sup>2</sup> in his postgraduate lecture given in January, 1924, refers to four classes of movements of teeth, and recognizes the "twisting" which takes place after extraction. But so far as I know, the exact effect on occlusion brought about by abnormal rotation of molars has not been described, although the condition is now recognized and treated as routine practice by some orthodontists. Therefore, perhaps it may not be out of place to go into detail about the subject.

The incidence of rotation, when a number of cases or a series of models, whether selected or unselected, is examined critically, is surprisingly high. In a series of 100 models of cases undergoing orthodontic treatment of various kinds, 57 were found to show rotations of various degrees. In a series of 100 entirely unselected cases, children at London County Council schools, all of them boys between the ages of nine and ten years, the number showing

\*Transactions of British Society for the Study of Orthodontics, March, 1930.

rotation of maxillary molars was found to be about 60. The great majority of these were associated with premature loss of deciduous molars.

Even more surprising is the incidence in ancient skulls. Rotation of molars has been seen in two young Bronze Age skulls. One skull was reported by Dr. Menzies Campbell<sup>3</sup> in the *British Dental Journal*, and photographs of the other skull have been very kindly lent by Professor Walmsley, Queen's University, Belfast. Both these skulls will be described in a later section.

It is not often that one can investigate a sufficiently large number of ancient skulls to make it possible to give any reliable percentage, but I was fortunate enough to be allowed to examine the collection of Bidford-on-Avon Saxon specimens at Birmingham, 39 of which had a sufficient number of teeth from which to make reliable observations. Of this number, 22 cases showed rotations in some form—56 per cent. A number of these, however, were associated with great wear and consequent destruction of normal contact points.

From this high incidence it may be argued that, once more, the term "normal" is being abused.<sup>4</sup> It certainly cannot be used in this connection in the sense of "average," but throughout this paper, unless definitely stated otherwise, "normal" refers to the morphologically normal condition, the ideal normal. To support this interpretation of the term it is hoped, as has been said, to show that any deviation from the normal, however slight, has a harmful effect on the denture described.

An attempt will be made to answer some of the practical questions which may be asked in connection with this subject:

- (a) What are the factors which may contribute to the cause of abnormal rotation?
- (b) Does rotation materially affect occlusion?
- (c) What is the definition of an abnormally rotated molar, and how can it be recognized?
- (d) Can rotation be treated successfully, and how?

#### ETIOLOGY

There are several factors associated with the causation of rotation of molars. Some of these are quite clearly defined and easy to recognize, both in their pathology and etiology, while others are much more obscure. The cases which are complicated with other forms of malocclusion, as many are, of course are the most difficult to diagnose. I have attempted to classify all the forms that I have been able to distinguish, entirely from the etiologic point of view.

The primary cause in every form of malocclusion may be said to be either lack or excess of growth of bone; nearly always, of course, the former.<sup>5</sup> Some of the ways in which bone growth and development may be retarded or stopped will be described.

## ACCIDENTAL OR LOCAL FACTORS, NOT RELATED PRIMARILY TO GENERAL DEVELOPMENT

*Premature Loss or Interstitial Caries of Deciduous Molars*

Of all the factors which lead to the determining cause of rotation this is the most fruitful, and also the easiest to recognize. There are many forms and degrees of such rotations, but there are two strong tendencies to be

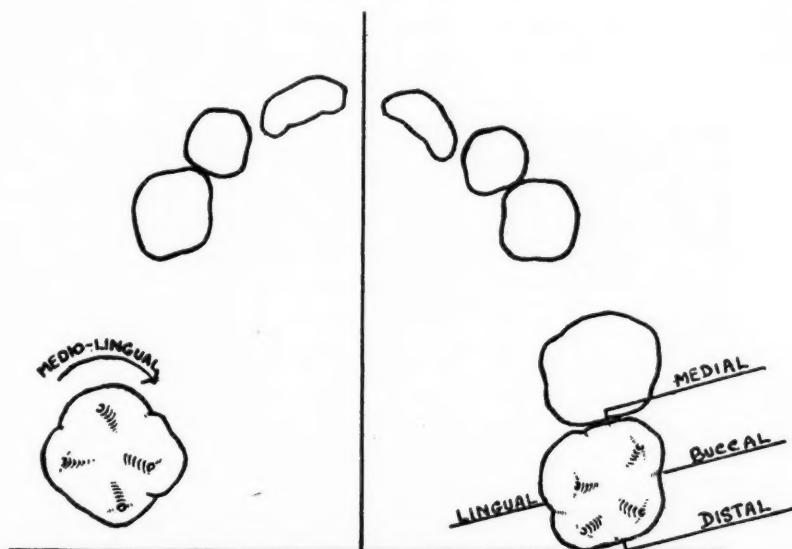


Fig. 1.—Diagram (reversed in the illustration) showing mediolinguinal rotation of maxillary left first permanent molar.

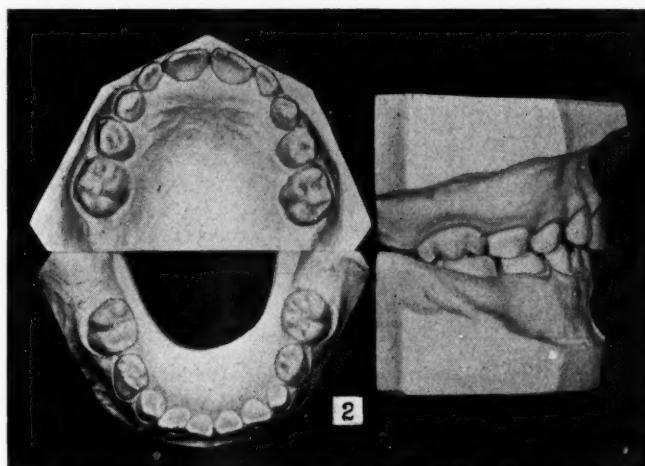


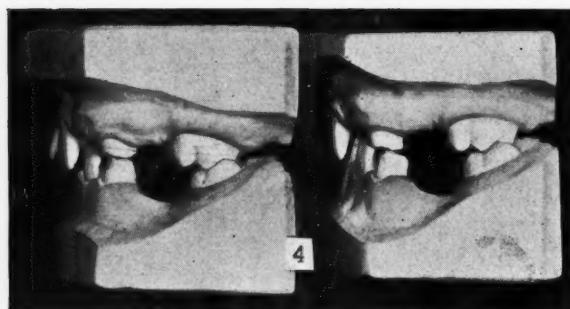
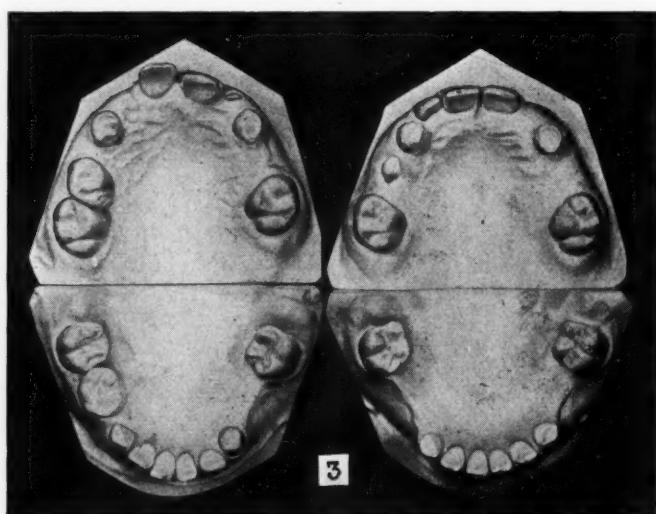
Fig. 2.—Forward drifting and rotation of first permanent molars following premature loss of deciduous molars. (Anthropometric Committee, Medical Research Council.)

noted. Almost always the rotation is in a mediolinguinal direction (Fig. 1), and very often it is associated with a bodily forward movement of the molar.

This medial movement is simply the normal forward growth of the teeth, but proceeding in an uncontrolled manner because the contacts of the unbroken arch have been disturbed. It is the teeth anterior to the space created by the extraction that really suffer chiefly from the early loss, as they

lose their impetus to forward growth which should have been transmitted through their distal contact points.

Other teeth also follow this general rule for forward movement into spaces, and even when there are notable exceptions, such as the distal movement of a mandibular premolar, this is actually less than it appears, since the whole of the arch has been growing forward in accordance with normal growth processes, while the premolar remains stationary, or perhaps does travel backward a short distance through the avenue of less dense bone offered by the sockets of the extracted first permanent molars. This opening



Figs. 3 and 4.—Twins, rotation following early loss of deciduous molars. (Medical Research Council.)

of a path of lessened resistance may be a factor in the movement of molars after the extraction of their deciduous neighbors, and there may even be some pull from the contracting tissues.

It is extraordinary in some cases to see the amount of space which is obliterated by this movement. In Fig. 2 the forward movement shown is certainly excessive, and comparatively little of it is rotation. The plane of occlusion is normal, showing that there is little or no tilting, and this is confirmed by the radiographs. As far as could be ascertained, the extractions of the deciduous molars were performed about two and a half years before these models were taken, when the boy was about six years of age.

In the great majority of cases of early loss of maxillary second deciduous molars the permanent teeth lose no time in encroaching on the space at their disposal, whether they are controlled by occlusion or not (Figs. 3, 4). Occlusion has a variable effect. In some cases the molars lock in correct occlusion and rotate together; sometimes they rotate together in incorrect occlusion. Often the maxillary rotation is independent of occlusion altogether.

When the contact point of the second deciduous molar is lost through caries, the permanent molar appropriates the extra space by rotating in a mediolingual direction. This abnormality persists and may be increased when the deciduous tooth is finally lost, thus robbing the second premolar of its share of space. This is one instance of the importance of good conservative treatment from the orthodontic point of view.

A pure forward movement, with no rotation involved, seems to be rare. It takes place, of course, to a certain definite extent during the change from deciduous molars to premolar teeth, but the slightest hitch in this process is evidenced by rotation of the permanent molars, as will be shown later.

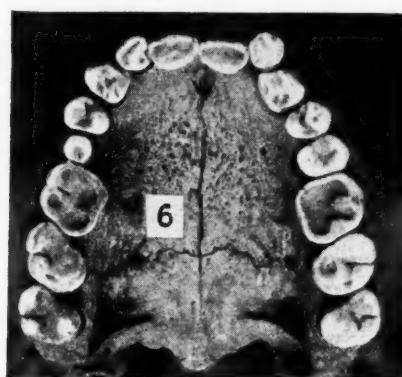
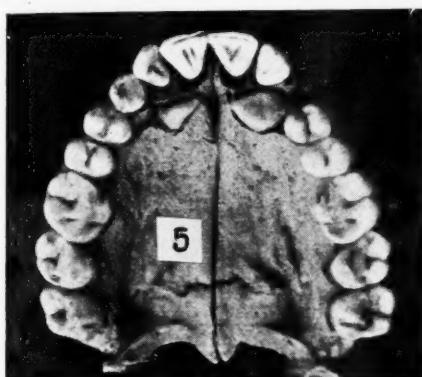


Fig. 5.—Rotation associated with retention of deciduous canines. (Saxon skull from Bidford, No. 56. John Humphries Museum, Birmingham.)

Fig. 6.—Rotation associated with abnormally small premolar. (Saxon skull from Bidford, No. 107. John Humphries Museum, Birmingham.)

#### *Prolonged Retention of Deciduous Canines*

If the maxillary permanent canine does not take up its position in the arch at the proper time, soon after the eruption of the premolars, the permanent molars take advantage of the extra room provided by the spacing of the premolars and rotate in a mediolingual direction (Fig. 5). The deciduous canine does not preserve sufficient space for its broader successor, and the latter will be unable to find room in the arch unless the rotation of the molars is corrected and the premolars are given space to move distally. It is, of course, possible that rotation in these cases may have occurred earlier and may have been associated with some other factor also.

#### *Abnormality in Shape or Size of the Premolars. Congenital Absence of Teeth*

The variations or total loss of contact points which result from any of these conditions will affect the movements of the permanent molars in a similar way to that shown in the foregoing cases, but the movement will occur at an earlier stage of development (Fig. 6).

From all the foregoing types of rotation a general impression would be gathered that the chief factor in the causation of such rotations is the presence of an abnormal space medial to the permanent molars. Also, that the almost inevitable encroachment on such space is the result of nature's effort to close the abnormal gap, brought about by a modification of her normal process of growth. But before leaving this section I must mention a reference to the subject made by Dr. Sim Wallace.<sup>6</sup> He states:

"The factor which determines whether a tooth will move forward is not so much the available space in front of it, as the available space behind it." Also: "The question as to whether or how much the molars will move forward hangs altogether on whether the jaws before the time of extraction had grown sufficiently to accommodate them without pressure of the molars behind."

This brings in another important factor, and helps to explain those cases in which, although the deciduous molars have been lost rather earlier than they should, there is no undue forward movement. Presumably in these cases there has been ample bone growth behind the first molars so that there is no pressure transmitted through them. At the same time, the forward movement can hardly depend entirely on this, as if there were no spaces in the arch the pressure from the developing molar region would be transmitted through it as a whole, and the molars would not be able to move individually. The space in front of the tooth undoubtedly provides the opportunity for rotation.

Dr. Sim Wallace does not mention rotation as a form of forward movement after extraction, but some of his illustrations show it well. His Fig. 51 shows a marked rotation of the left maxillary first molar, due to the shifting round of the teeth caused by the absence of the lateral incisor of the opposite side. It is remarkable that the teeth on the same side as the extraction are much less affected than those on the other side. The latter are all progressively further forward than the corresponding teeth on the right side.

PARTIAL OR COMPLETE ABSENCE OF FORWARD MOVEMENT OF MANDIBULAR DECIDUOUS TEETH IN RELATION TO MAXILLARY DECIDUOUS TEETH BEFORE THE AGE OF EIGHT YEARS

The whole subject of the changes that occur in occlusion between the ages of three and eight years has been dealt with very fully by Dr. Friel in various papers.<sup>7, 8</sup> The points that I wish to bring out here cannot be understood without detailed references to these changes, therefore Dr. Friel has allowed me to make use of his diagrams to illustrate them.

At three years of age the occlusion of the deciduous teeth, if in normal relationship, is quite definite. The triangular ridge of the mediobuccal cusp of the maxillary second deciduous molar fits closely into the mediobuccal groove of the mandibular second deciduous molar; the oblique ridge into the distobuccal groove, and the well-marked mediolingual cusp is received into the cup-shaped central fossa of the mandibular tooth. The relationship of the distal borders of these two teeth with this occlusion is of the greatest importance in connection with the ultimate occlusion of the permanent teeth,

and it is a relationship which is capable of being somewhat misinterpreted, as the variation in expert opinions seems to show.<sup>8, 9, 10</sup>

The crux of the discussion seems to be: Is there, or is there not, a projection of the maxillary second deciduous molar distally beyond the mandibular second deciduous molar, which guides the maxillary permanent molars into their correct occlusion?

In the first place, it is impossible to judge by examining the mouth with a mirror only, as the angle at which the mirror is held will affect one's judgment. Second, bad models are worse than useless, as the distal borders are the most likely to be distorted. And last, the angle at which the models are viewed alters the apparent relationship of the parts. They should be looked at at right angles to the line of the arch, as this passes along the buccal sur-

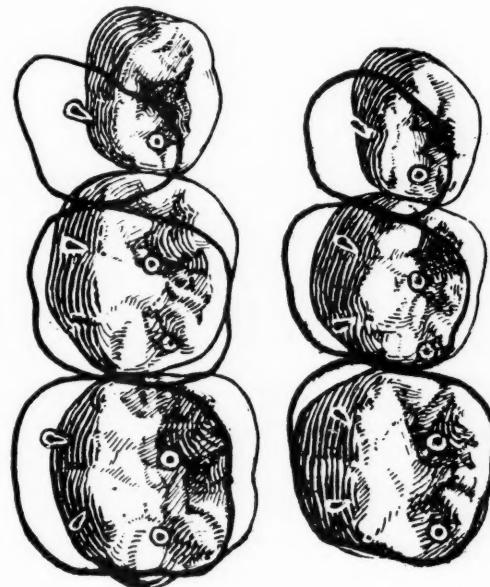


Fig. 7.

Fig. 8.

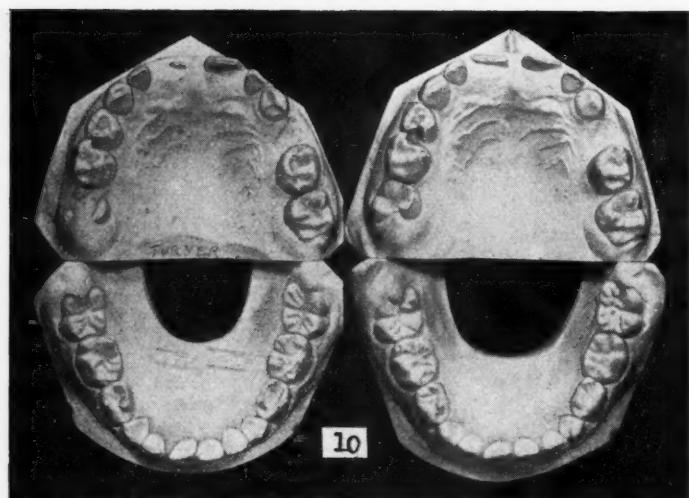
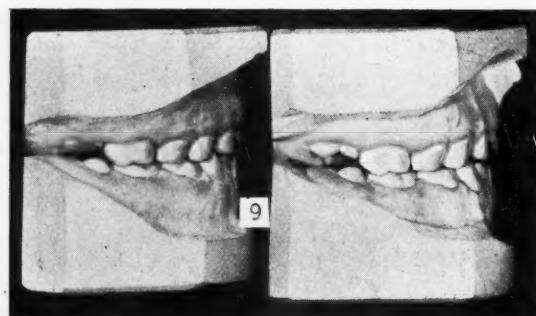
Fig. 7.—Drawing of the mandibular teeth (Fig. 17 A) placed in supposed correct line with the outlines and points of cusps of the maxillary teeth in morphologically normal occlusion of deciduous teeth, showing relationship of distal surfaces of maxillary and mandibular deciduous molars.

Fig. 8.—Drawing of the mandibular teeth of Fig. 12 A, as explained under Fig. 7.

faces of the teeth, and not obliquely. If these points are borne in mind, the majority of cases in which no forward movement has taken place will be seen to show that those points on the distal borders of the deciduous molars which form, or will form, the contacts with the permanent molars, maxillary and mandibular, are in the same vertical plane. In a great many cases there is actually a projection of the maxillary tooth beyond the mandibular, but on closer investigation this usually proves to be the bulge of the distolingual cusp, which will fit the distolingually sloping medial surface of the maxillary first permanent molar, and which is placed lingually to the contact point.

It is the relationship *at the contact points* between deciduous and permanent molars, both maxillary and mandibular, which is the essential point.

Taking the maxillary contact point first, the anatomy of the adjacent surfaces must be considered. The distal surface of the deciduous molar has a bulge below the distolingual cusp which is not in contact with the permanent tooth at all; the smaller bulge below the distobuccal cusp should form the point of contact, meeting the corresponding bulge below the mediobuccal cusp of the permanent molar. This point is placed approximately at the end of the buccal third of the total length of the medial surface of the latter tooth. The surfaces of the two teeth should be parallel, and sloping distolingually.



Figs. 9 and 10.—Erupting first permanent molar, showing mediolingual cusp at lowest level. (Medical Research Council.)

The corresponding relations of the mandibular teeth differ somewhat. The medial surface of the permanent molar has only a slight convexity, and in general direction lies at right angles to the line of the arch. The distal surface of the deciduous molar is rather variable, with the variations in size and position of the distal cusp. This cusp forms the contact point, which normally is placed almost at the buccal angle of each tooth.

Taking a case where no forward movement of the mandibular teeth has occurred up to the time of the full eruption of the permanent molars—if the medial surfaces of the maxillary and mandibular molars, when in occlusion,

are superimposed, and their contact points with the second deciduous molars, as described, are also shown, it can be seen that the maxillary and mandibular contact points are lying in the same vertical plane; they almost coincide, at the point of intersection of the lines representing the medial surfaces of the maxillary and mandibular teeth (Figs. 7 and 8).

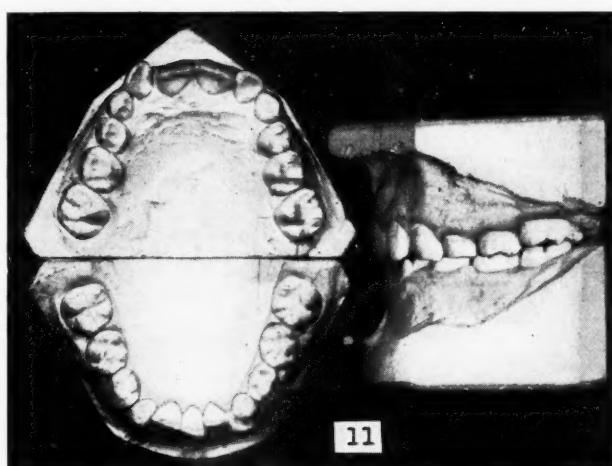


Fig. 11.—Rotation associated with non-forward movement of mandibular deciduous teeth.

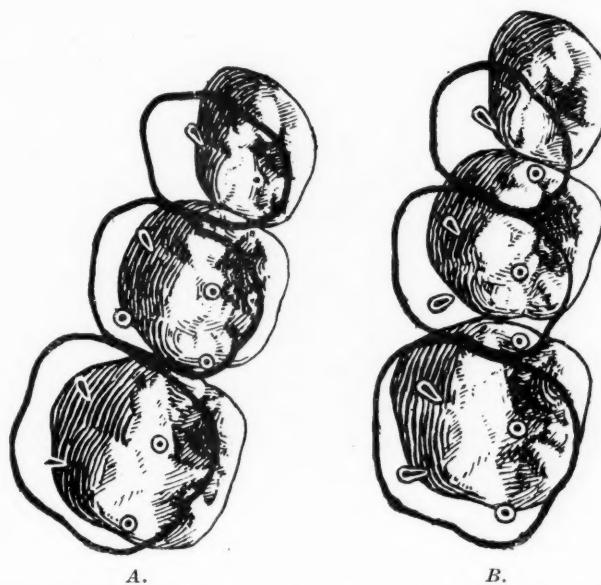
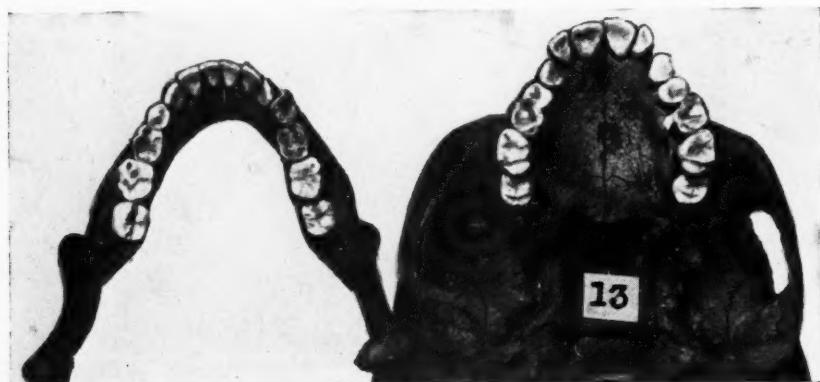


Fig. 12.—Occlusal drawing of left side of Fig. 11. *A*, Actual conditions, showing rotation of maxillary and mandibular first permanent molars. *B*, Reconstructed arch, morphologically normal occlusion, showing that forward movement of mandibular teeth is a necessity.

Bearing in mind the morphology of the permanent molars, it is obvious that normal occlusion of these teeth cannot be attained under these conditions. A cusp-to-cusp contact only is possible. The diagrams referred to by Friel<sup>s</sup> show this condition, and also two other rearrangements which may take place.

1. The medial surfaces of the permanent molars are flush, that is to say, their contact points are in the same vertical plane. The maxillary molar is correct in position, but the distal position of its antagonist will not allow of correct occlusion. If this condition persists, there is marked wear of the cusps. More often there is one of the following adaptations to gain a greater functional efficiency.

2. Shows a bodily distal movement of the maxillary molar, so that it may reach occlusion with the mandibular. This does not seem a likely solution of the problem, as it is contrary to the direction of normal movement



Figs. 13 and 14.—Rotation associated with non-forward movement of mandibular deciduous teeth and Bronze Age skull. (Anatomical Department, The Queen's University, Belfast.)

and growth, and clinically it is rare to find a space between deciduous and permanent molars if the deciduous arch is unbroken.

3. Shows the most common condition which is the result of insufficient forward movement of the mandibular teeth, namely, a rotation of the maxillary permanent molar. This tooth in the course of its development and eruption goes through various changes in position and direction, as is well known. Its earlier positions will be described elsewhere. The main point here is that, as the tooth actually comes into occlusion, the well-marked mediolingual cusp is the most inferior portion and is the first part to touch its antagonist (Figs.

9 and 10). Normally it should drop straight into the central fossa of the mandibular molar, but if there is an abnormal anteroposterior relationship, this cusp will strike instead some point medial to this. In a slightly postnormal case this point will be the sloping edge of the cup-shaped fossa, and the cusp will be guided down into its proper occlusal position, or very close to it. But, in making this movement, the tooth must rotate in order to allow the adjustment. The mediobuccal cusp travels in a mediolingual direction, the contact point moving toward the center of the distal surface of the deciduous tooth. The whole of the occlusion of the permanent molars is thrown out, and also the maxillary tooth now takes up more space in the arch than it should, by reason of a diameter greater than the true mediolateral diameter

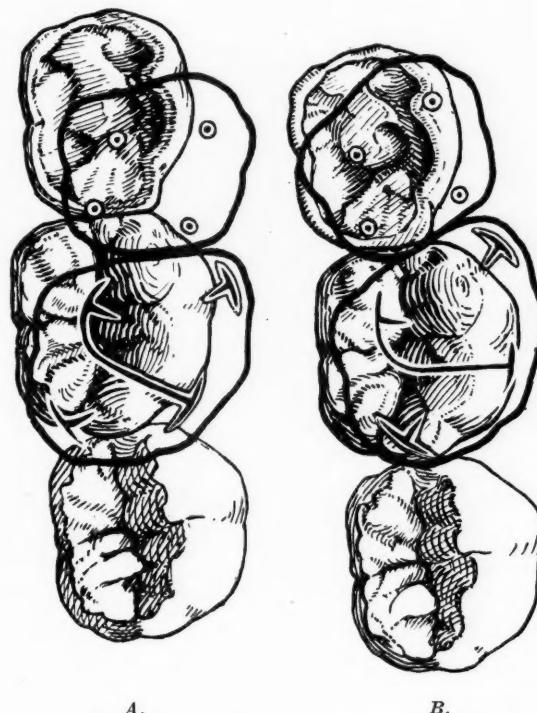


Fig. 15.—Occlusal drawing of right side of the Bronze Age skull shown in Fig. 13. *A*, Actual conditions showing rotation of molars. *B*, Reconstructed arch, morphologically normal occlusion, showing that forward movement is a necessity.

now lying in the line of the arch (Figs. 11, 12, 13, 14, 15). (Campbell's Bronze Age skull shows a similar condition to the Belfast skull.<sup>3</sup>)

There is one solution of the problem of occlusion in these cases of non-forward movement, and that is rotation of the mandibular molars as well as the maxillary molars. It is made easier if the distal cusp of the mandibular deciduous molar is small or absent. It is seen sometimes when the mandibular arch is a little narrow in the molar region, as well as being slightly postnormal. A distobuccal rotation of the mandibular permanent molar ensures correct occlusion with the mediolingually rotated maxillary molar, and is an example of a morphologic abnormality which is, nevertheless, functionally normal.

ACCESS OF TRANSVERSE GROWTH IN THE MAXILLARY PERMANENT MOLAR REGION  
AT THE TIME OF THE ERUPTION OF THESE TEETH WHEN THE  
DECIDUOUS ARCH HAS REMAINED NARROW

The access of growth referred to is that spurt of lateral development which is sometimes seen associated with the eruption of the permanent mo-

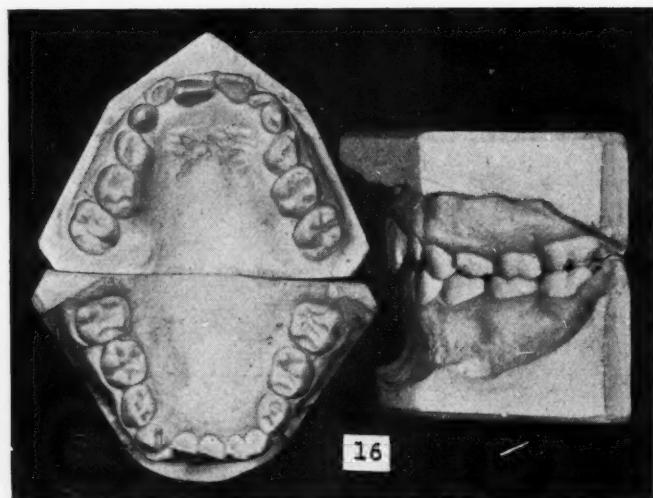


Fig. 16.—Rotation associated with access of transverse growth in permanent molar region.

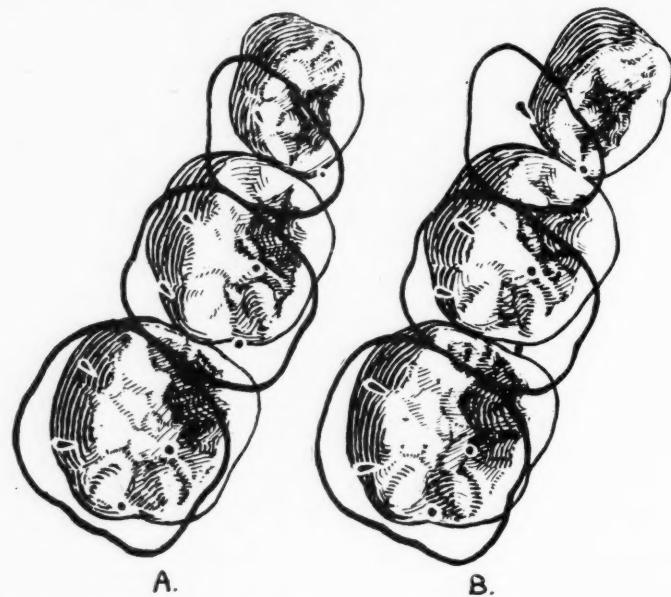


Fig. 17.—Occlusal drawing of left side of Fig. 16. *A*, Actual conditions, showing rotation of permanent molars. *B*, Reconstructed arch, morphologically normal occlusion.

lars, while the deciduous arch remains narrow as the result of some early interruption of lateral bone growth (Figs. 16, 17, 18).

This type of rotation is apparently distobuccal, the center around which rotation has actually taken place being the mediobuccal cusp. The line of

the arch receives, as it were, a sudden bend outward, pulled by the laterally growing bone. The first permanent molar makes contact with the second deciduous molar at a point on the surface of the latter which is more buccal than normally, and touches the second deciduous molar at its distobuccal angle. It is at this contact point that the outward bend of the line of the arch begins. It must be clearly shown, however, that although the medio-buccal cusp is the center of rotation, it is the *distobuccal* cusp which is the most nearly correct in position, as the medial border of the tooth is still joined to the narrow deciduous arch, and is placed too far lingually. This is of great importance in treatment.

The history of a case showing similar conditions is of interest. The boy was selected for observation when he was six years, one month old, because

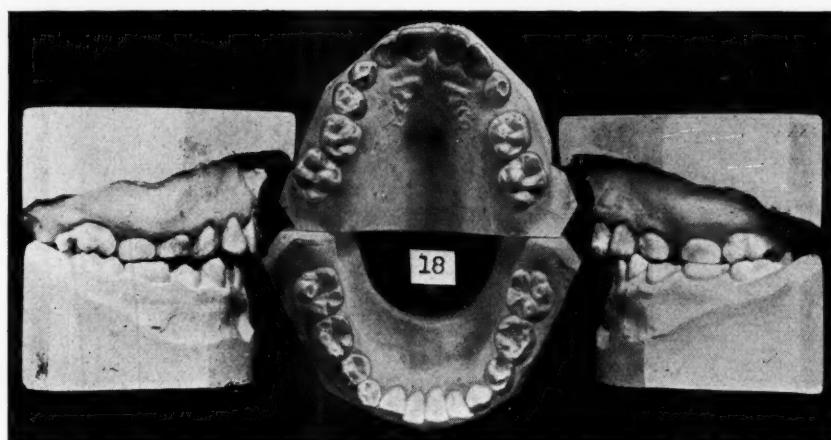


Fig. 18.—Rotation associated with access of transverse growth in permanent molar region.  
(Medical Research Council.)

he had regular deciduous arches and correct occlusion for three years, but no spacing. There was no sign of his permanent molars at that time. He was a very stupid-looking child and lacking in vitality in every way. Measurements were taken at that time and three months later, and the increases were negligible, if any at all. Three months later he was remeasured, and showed an increase of 3 mm. in zygomatic breadth, and 2 mm. in bigonial breadth, other measurements showing a slighter increase, while the width of the mandibular deciduous arch remained stationary. At this time the permanent molars were erupting, and the incisors were about to erupt. Unfortunately models were not taken, and these observations are from notes. After this third observation he was lost sight of for some time, and when seen again was nine years old, looking much more intelligent, and bearing a report of good progress and a normal interest in work and play. There seemed to be a possible connection between the spurt of alveolar growth which is so marked and the unexpectedly noticeable improvement in general physical and mental development.

INTERRUPTION OF TRANSVERSE GROWTH IN THE MAXILLARY PERMANENT MOLAR REGION AT THE TIME OF THE ERUPTION OF THESE TEETH, THE DECIDUOUS ARCH BEING NORMALLY DEVELOPED

This condition, the converse of that just described, is sometimes associated with rotation of the maxillary molars in the opposite direction to that usually shown. They show a distolingual rotation. The deciduous arch has a normal or almost normal lateral development, but growth fails at the critical time of the eruption of the permanent molars, so that the distal borders of the latter are not carried far enough in a buccal direction, and the line of the arch is bent lingually. This may be accentuated when the molars come into occlusion, by the maxillary ones being forced into lingual occlusion, especially if the mandible has not suffered from the same growth-check as the maxilla and is, therefore, wider than the maxillary arch in the molar

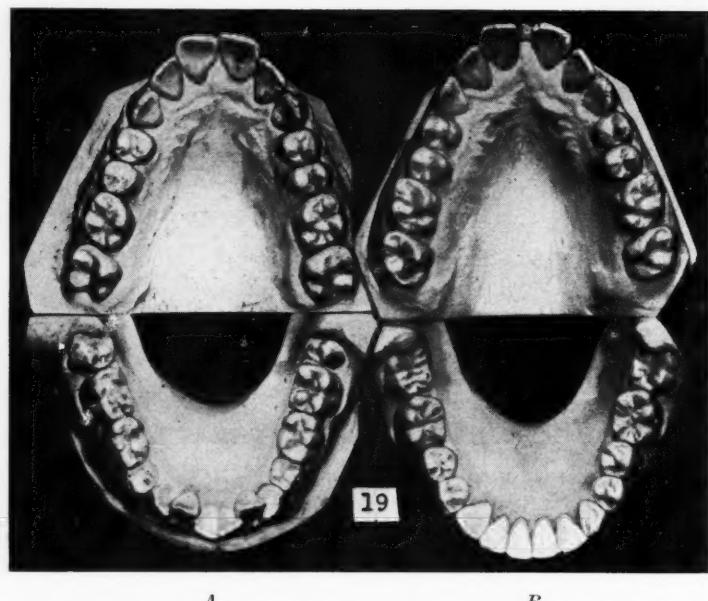


Fig. 19.—*A*, Rotation in conformity with a V-shaped maxillary arch; *B*, V-shaped maxillary arch, but no rotation of molar. (Medical Research Council.)

region. This type of case is sometimes associated with postnormal relationship of the mandibular teeth, and this makes lingual occlusion of the maxillary molars more likely still, as the broadest part of the mandibular arch, the molar region, is opposed to that part of the maxillary arch which is suffering from lack of lateral growth, namely, the distal portions of the permanent molars.

ROTATION IN CONFORMITY WITH A V-SHAPED MAXILLARY ARCH

The V-shaped maxillary arch is a well-defined type of abnormality which is usually associated with some degree of postnormal occlusion of the mandibular arch.

The direction of rotation is mediolingual, but at first sight this is not at all obvious, as there is no irregularity in the line of the arch, the permanent

molars being in a straight line with the deciduous molars or the premolars. But the progressive narrowness from behind forward has in fact necessitated a rotation of all the cheek teeth; and if the deciduous molars could be placed in their correct positions, the rotation of the permanent molars would become apparent. This is actually what occurs if such a case is treated by expansion of the anterior part of the arch without rotation of the permanent molars; and when the postnormal relationship, if present, is corrected, it will be found to be impossible to restore normal occlusion of the molars. Abnormal rotation in postnormal cases is in this way a definite obstruction in the way of successful treatment.

In some cases of this type the permanent molars erupt in their correct positions with no abnormal rotation, and when this happens they appear to show greater abnormality than their abnormally rotated neighbors, because they do not conform to the general shape of the arch (Figs. 19, *A* and *B*).

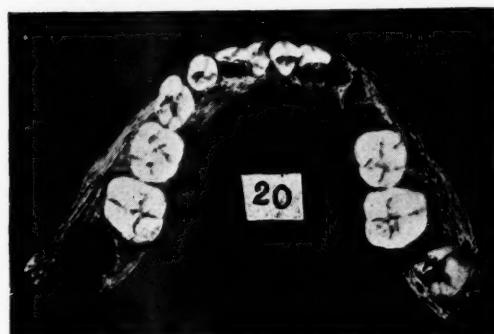


Fig. 20.—Mandible from Stratford, probably Saxon, showing static rotation of second permanent molar in crypt. (John Humphries Museum, Birmingham.)

**NORMALLY ROTATED POSITION OF MAXILLARY MOLARS IN THE CRYPTS, AND FAILURE  
TO ROTATE DURING ERUPTION INTO THEIR CORRECT POSITIONS FOR  
NORMAL OCCLUSION WITH THE MANDIBULAR MOLARS**

In this section the term "rotation" is used in two senses: first, to describe the *static position* of the teeth within the crypts—a normal condition, so far as I can tell, although there is not very conclusive evidence; second, a *movement* of rotation will be described, as forming part of the eruptive activity of the permanent molars—also a normal condition, so far as the evidence goes. These meanings of the term are quite different from the sense in which it has been used previously where abnormality has always been implied, but it did not seem possible to make use of any other term to describe the conditions referred to in the present section.

It is a well-established fact that the permanent molars undergo progressive changes in their positions and in the direction of their movement during the course of development. The combination of downward and forward movement of the maxillary molar—which is one kind of rotatory movement—is particularly noticeable, but another component part of development has not received so much attention. This is rotation around the long axis of the tooth. There is no doubt that this movement does take place, but the diffi-

culty is to ascertain the exact position and amount of rotation of the molars within the crypts which may be considered normal, before any developmental movement has taken place.

Professor Brash is definitely of the opinion that this progressive rotation during development takes place, and it is well seen in the specimens of pigs' jaws on which his researches on bone growth were carried out.<sup>11</sup> In fact, to arrive at correct occlusion, all the molars in the pig have to rotate continuously during development and eruption.

The mandibular molars, both in the pig and in man, lie in the crypts in a position of distobuccal rotation, and during development they describe a



Fig. 21.—X-ray photograph of a child five years old, showing rotation of maxillary right first permanent molar in crypt. No rotation on left side. (Anatomical Department, Trinity College, Dublin.)

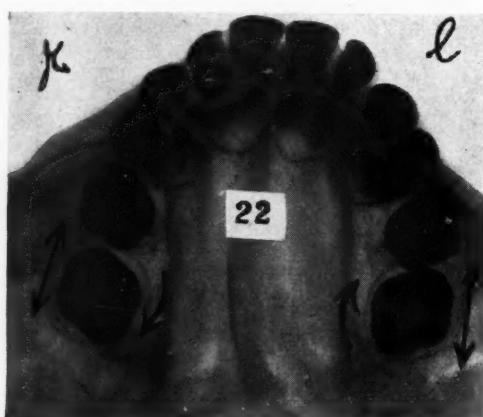


Fig. 22.—X-ray photograph lent by Dr. A. Martin Schwarz\*.

rotation which is a combination of distolingual and mediobuccal movement, mainly the former. This shows very plainly in the case of the second permanent molars, in the ancient mandible of a child of about seven years old which is from Stratford and is probably of Saxon date (Fig. 20). It is also seen in the mandible of Dr. Menzies Campbell's case, and here is also evidence that the normal process of distolingual rotatory movement can go too far and produce an over-rotation such as is shown by the left first permanent molar. This is perhaps the result of the partial impaction of this tooth, but a similar over-rotation is shown in Fig. 10. The opposite condition, however, is more

\*Der heutige Stand der Orthodontie hinsichtlich Prophylaxe und Frübehandlung, Scheff's Handbuch der Zahnheilkunde, Neuauflage Pichler 5: 1930.

often found, as would be expected; this is the result of arrest of growth, with persistence of the developmental position of rotation.

The maxillary molars of the pig lie in a position of distolingual rotation and have to describe a movement of distobuccal rotation to reach correct occlusion. Professor Brash would have expected a similar condition to characterize man's molars, and Dr. Schwarz of Vienna also describes the normal developmental position of the maxillary permanent molar as having its buccal surface facing distobuccally. It was impossible to settle this point on the many young skulls of the Bidford collection, as the teeth were either rattling about loose in the crypts, or had been stuck in with doubtful accuracy, and there was no definite conformation of the crypts themselves showing the rotation, as there is in the case of the mandible just shown. Fig. 21 shows an x-ray photograph of permanent molars still in their crypts. It can be seen that the medial outline of the pulp chamber is rotated mediolingually on one side and not on the other. Dr. Schwarz kindly lent me two x-ray photographs showing the first permanent molars still in their crypts. The age of the specimens is not stated. On one side the maxillary first permanent molar is slightly rotated mediolingually, and on the other side there is apparently no rotation. From this point the evidence is based on observation of very early stages of eruption, and so far as it goes that evidence is strongly in favor of the presence of a *position* of mediolingual rotation, normally, while the maxillary permanent molar is still within the walls of the crypt. During eruption there should be a mediobuccal *movement* of rotation in order to bring about normal relations with the mandibular molar.

When all the movements during development are considered together as one, the process may be said to resemble the path of a corkscrew, the well-marked mediolingual cusp of the maxillary molar being the guiding point. The direction is downward, forward and inward. This adjustment for normal occlusion is a very delicate one, and it can only be carried out completely if all the surrounding parts are in strictly normal conditions. It would be reasonable to suppose that any slight growth check would interfere with these movements, or that any mechanical obstruction, such as slightly post-normal occlusion of the mandibular teeth, would prevent their completion. In such cases a greater or lesser degree of its developmental position of rotation in a mediolingual direction remains after the maxillary molar is fully erupted.

This type of rotation, therefore, is the result of an arrest of development locally, and may be the only evidence of failure of full growth. It is usually associated with other more or less slight evidences, such as insufficient forward movement, or close bite, and it is only when the case is seen just before the molars are in occlusion that this persistence of developmental rotation can definitely be cited as a factor. Normally the medial cusps of the maxillary molars should be exactly prepared to occlude correctly with the mandibular molars just before they actually come in contact with each other; if developmental rotation of one of the opposing pair persists, this is not so, and whether or not correct occlusion will ever be attained is an open question. If non-forward movement is a co-factor, it is certain that the rotation

will persist, as the mediolinguinal cusp is held in its position by its occlusion with the mandibular tooth. But if lack of full eruption rotation is the only symptom of arrest of growth, it is possible that the final full contact with the mandibular molar, if this tooth is in correct position, will provide the stimulus for completion of the normal movement of the maxillary molar.

Confirmation of this progressive developmental rotation may be found in the parallel case of the rotation which the maxillary lateral incisors have to undergo in order to reach their positions in the arch. Their developmental positions are very clearly shown in the illustrations of Professor West's paper.<sup>12</sup> It is also interesting to remember how frequently these teeth erupt in their earlier developmental relationship to their neighbors if there has not been sufficient alveolar growth to complete their full normal movements.

#### DIAGNOSIS AND TREATMENT

In the diagnosis of rotations of molars it must be borne in mind that the term "rotation" is a relative one. Like many other problems of orthodontia, this condition has no fixed or definite standard of normality. Each case has its own norm in this one particular which is in harmony with the normal general form of the arches for that case. There are as many variations within the normal for this one character as there are for the size and shape of the arches of different individuals, or for the shapes of the teeth themselves. Therefore it is as impossible to give a definite answer to the question, "What is a rotated molar?" as it is to define a normal arch.

The simplest way to see the variations in position is to represent the maxillary molars by quadrilateral outlines, and then to select some base line, as constant as possible, by which the relative positions can be tested. The most convenient is a line at right angles to the median raphe. This may be drawn behind the molars, and in normal cases will pass through the most distal points of both teeth. If one molar has moved forward more than the other, the line will touch only the more distally placed tooth and will indicate the difference in movement (Fig. 1). Lines may be drawn parallel to the base line at any point in the arch, and, provided the median raphe is not distorted, will be a valuable guide. A line drawn through the mediobuccal angle of one of the molars, if it does not pass through the corresponding point of the other molar, will reveal which tooth is rotated and how much more room in the arch it is taking up than its fellow. Such calculations can be made with exactitude on careful drawings, but it is not practicable to do this with every case which comes up for diagnosis. A reasonably accurate idea can be obtained, however, with the aid of a symmetroscope in studying the models. Even without this the eye quickly becomes trained to detect abnormalities of this type, especially if the backs of the models are cut parallel to the base line referred to. The correct trimming of models in this way is of the greatest help in diagnosis.

Another useful test is to prolong the line of the buccal wall of the maxillary molar until it intersects the base line behind and shows its relationship to the line of the arch in front. If the molar is rotated, this line will cut the line of the arch (if this is normal otherwise), and will intersect the base line at too acute an angle.

These tests are all made on the maxillary model and reveal only abnormalities in relationship to the rest of the maxillary arch. More important still are the relationships with the mandibular arch—the occlusion with the mandibular molar. A detailed study of the models is the most satisfactory method of diagnosis, but an accurate knowledge of the ideal conditions is required. These relations have been referred to at length in the section on rotation due to non-forward movement.

The cutting out of the center of the mandibular models gives a much better view of the lingual relations, which are of the utmost importance in diagnosing not only abnormal rotations, but any form of malocclusion.

A rough test which can be done in a moment in the mouth is to get the patient to bite hard into a piece of soft composition placed between the molars. When hard, the impression can be pierced by a sharp probe at the tips of the cusps of the maxillary molars, and the reverse side will show if

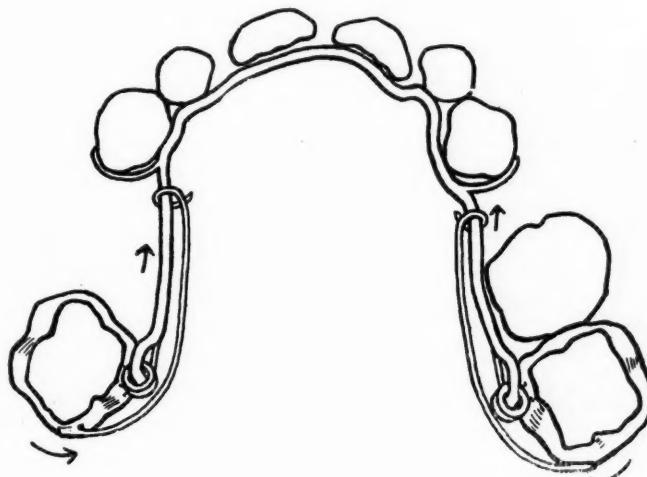


Fig. 23.—Rotation appliance. Showing rotation springs and spurs to counteract forward thrust.

they occlude in their correct positions. All tests of occlusion for abnormal rotation of maxillary molars depend on whether the mandibular molar itself is normal. It does not vary nearly so much as the maxillary, and its position is easier to judge by eye, the two lingual cusps being normally in a straight line with the lingual cusps of the deciduous molars.

Having decided that abnormal rotation of one or more molars is a symptom of a certain case, it is necessary to try and ascertain to which etiologic class it belongs. Treatment must be based on this.

Generally speaking, the center of the movement of the rotation treatment should be as nearly as possible the same as the center of the abnormal movement has been, the direction being of course reversed. In the appliance,<sup>13</sup> this center is represented by a short round vertical tube soldered to a band on the molar to be treated, parallel to its long axis, at a point as near to the true center of rotation as possible. Into these tubes fit the right angle ends of a lingual bar, held in place by latches. The bands can rotate freely around the vertical ends of the bar. The force is supplied by springs which

are soldered to the distolingual corners of the bands and brought around, lingually, to a point about opposite the first deciduous molars or premolars, where they are curled securely around the lingual bar. The ends must be fixed so that they cannot slip off the bar, but loosely, so that the spring can slide along the bar when the band is rotated (Fig. 23). The spring is of the beam type, the action of which was explained fully by Mr. McKeag in his paper last year.<sup>14</sup> Both ends are trying to straighten out, but the distal end being fixed to the band, which can only rotate, the desired movement in a

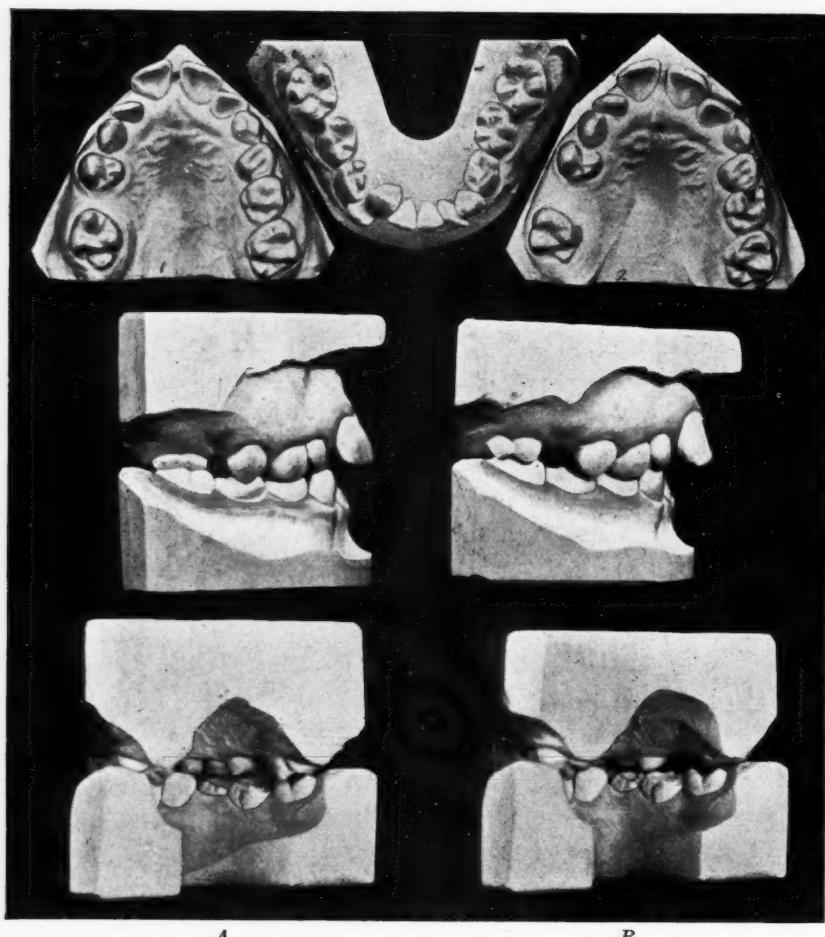


Fig. 24.—*A*, Rotation of molars due to premature loss of deciduous molars. *B*, Molars rotated, note amount of space gained for second premolar, and restoration of normal occlusion.

distolingual and mediobuccal direction is obtained. The appliance is sprung into place, and a state of constant tension is maintained.

The reaction of these springs must always be carefully considered when an appliance is being planned. The reaction is forward and inward on each side. In a double rotation the inward or lingual components of the reaction of the two springs counterbalance each other, but the forward pressures combine and are a force to be reckoned with. This reaction can sometimes be made to serve a useful purpose.

The principles of the appliance described can be applied to any case of mediolinguual or distobuccal rotation, with special adaptations for the etiologic class to which it belongs.

#### LOCAL FACTORS—PREMATURE LOSS OF DECIDUOUS TEETH, ETC.

In these cases the main object of treatment is to regain the maximum amount of room for the premolar and canine teeth by rotation. If there is little bodily movement, the prognosis is good, however severe the rotation may be (Fig. 24).

Where there is a space medial to the molar, the reaction of the rotation spring can be most usefully employed. A spur soldered to the lingual arch, touching the first deciduous molar or premolar distally, will take the forward thrust, not only preventing the molar from moving forward as well as rotating, but also keeping the other tooth from drifting away from its medial neighbor. Spurs of this type, placed distal to deciduous molars or canines, or premolars are always advisable when it is important to gain room in front of the molars which are being rotated. The force of the reaction is surpris-

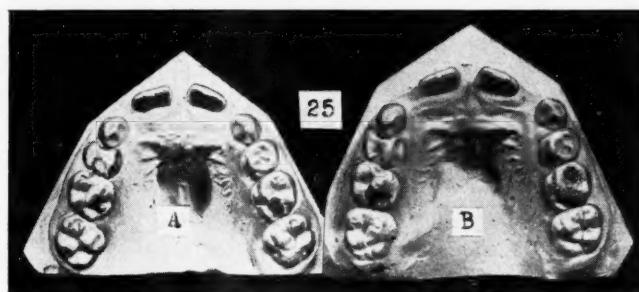


Fig. 25.—Case treated by rotation and lateral expansion; *A*, before treatment; *B*, after treatment.

ingly great; it will sometimes be sufficient to move a lingually placed maxillary incisor outside the mandibular teeth when the overbite is not too deep.

In cases of congenital absence of teeth the necessity for treatment only arises if the occlusal relations show such abnormality that it is obvious that rotation of the molars would improve function.

#### LACK OF FORWARD MOVEMENT

The main object here is to correct occlusal relations. If the deciduous arch is unbroken, there is no danger of lack of space for the premolars. In these cases it must be remembered that if the mandibular teeth remain in their postnormal position, the result of rotating the maxillary permanent molars into correct position will be to bring about one or other of the conditions shown in Dr. Friel's occlusal diagrams previously referred to, which is of no advantage unless combined with the correct amount of forward movement of the mandibular teeth. Therefore, this should be encouraged at the same time. If necessary the cusps of the deciduous teeth should be ground down. This may not be sufficient, and the appropriate treatment for inferior postnormal arch relationship should not be delayed (Fig. 25).

## ACCESS OF TRANSVERSE GROWTH

Here the required movement is really a mediobuccal rotation, and to obtain this the same appliance can be utilized, in conjunction with a buccal expansion from a U-shaped loop in the lingual arch. This not only moves the medial cusps of the molars buccally, but at the same time provides the means for the expansion of the deciduous arch which is necessary.

## INTERRUPTION OF TRANSVERSE GROWTH

These cases require the opposite kind of rotation to all the others described, namely, a distobuccal movement. This can be brought about by a lingual arch, the ends of which lie in horizontal tubes soldered to the molar bands; the ends of the arch are bent outward from the point where they enter the tubes, and the arch is sprung into position. If the whole of the posterior part of the arch is too narrow, a U-shaped loop can be used.

## V-SHAPED ARCH

Lateral expansion is always necessary in cases of this type, and can be performed by auxiliary springs soldered to the bar of the rotation appliance. Their reactions, like the lingual part of the rotation spring reaction, cancel each other. If the case is postnormal, and there is protrusion of the maxillary incisors, the bar should be away from these teeth, so that the reaction of the rotation springs does not tend to increase the protrusion. If, on the contrary, the incisors are inclined lingually, the bar should fit closely to their cervical margins, and should carry auxiliary springs to correct this inclination.

I have attempted in this paper to show the working of the many factors that may lead to abnormal rotation of the first permanent molars in particular, with special reference to the injury to the normal development of the denture that this condition may produce. The treatment of rotation has been briefly reviewed, and it appears, from the examples shown, that the results obtained have materially assisted in the general orthodontic treatment of these cases.

I am greatly indebted to Professor Brash for his advice and assistance, and for the use of the skulls in the John Humphries Museum, Birmingham; to Dr. Sheldon Friel for his help and the loan of his models and diagrams; to Dr. Menzies Campbell and Professor Walmsley for the slides of the Bronze Age skulls; to Mr. Northeroft for the use of models for reference; to Sir Frank Colyer for the loan of a slide of a specimen in the museum of the Royal College of Surgeons; to Dr. Schwarz of Vienna for advice and the loan of photographs; and to Miss P. Wilson for the drawing of the diagrams.

My thanks are also due to the Medical Research Council for allowing me to use material collected during my work for the Dental Committee.

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#### DISCUSSION

The *President*, in opening the discussion, said that the society had been favored with a comprehensive study of the anatomy and physiology and pathology of the molars and the molar occlusions.

*Dr. S. Friel* said it was a remarkable fact that so few references had been made in orthodontic literature to this subject, considering the injury which the condition did to the development of the denture. Moreover, it was not a new condition, as the young skulls of the Bronze Age and the Saxon skulls had demonstrated. The treatment of abnormal rotation of molars was a most satisfactory operation, especially in those cases which were due to premature loss of deciduous teeth. The opening of spaces which were partially closed was always difficult, and if one was able to obtain 3 or 4 mm. space by rotating the molars, it was a great advantage.

Miss Smyth had stressed the point that one must consider the forward reaction of the auxiliary spring. In those cases due to premature loss of deciduous teeth, if one did not put on spurs engaging the distal surface of the tooth medial to the space, the molar would rotate round the mediobuccal cusp, the mediolingual cusp coming forward, and though one had a rotated molar one gained no extra space. The time of treatment of cases of inferior postnormal arch relationship was reduced if one first rotated the maxillary molars, and partial relapses were less frequent. Previously when the mandibular arch was brought forward and the molars were not rotated and one had the buccal cusps apparently correct, the mediolingual cusp of the maxillary first molar came in contact with the distal wall of the central fossa, and this was an unstable position. There are two other points which are rather controversial. One of these was the interpretation of the term "normal." Miss Smyth had used the term in a morphologic sense, and the speaker thought that was the only sense in which it could be used for the diagnosis of malocclusion of molars and premolars. The teeth occupied rather a unique place in the body. They were the only part of the body which was completely formed—so far as the crowns were concerned—long before they came into a functional state. In every other part of the body, the bones for instance, the part was influenced by environment and the exercise of function from birth to maturity. In the case of the teeth the environment had little or no effect, and the exercise of function had none at all. The teeth were very like two component parts turned out by a Ford factory, ready-made to fit. He did not think that the occlusion of the molars and premolars could be reduced to any measurable figure. Hellman in a paper in 1921 on the subject of occlusion tried to find a biometrical normal for occlusion and to reduce it to measurable figures. He gave the value of a unit to each contact of a cusp with groove, etc., and altogether found 138 contacts in ideal occlusion. Now he examined a series of normal skulls and found that the average number of contacts was 124, with a standard deviation of 8. Therefore a skull with 116 or one with 132 contacts was within the range of normality. The number of

contacts for the incisors and canines was twelve. Thus there was ample scope for having the incisors and canines as malplaced as one pleased and for them still to be within the range of normality. He did not think that Hellman's scheme was at all suitable. If one took another case where there was a slight inferior postnormal arch relationship, all the contacts would be wrong and completely outside the range of normality and yet functionally it would be almost perfect. When one considers that Hellman's biometrical normal was based on the examination of selected skulls, what would be the standard deviation if it had been a true biometrical normal founded on nonselected cases whose only qualification was that they had the requisite number of teeth and were at the same stage of development? In the nomenclature committee's report of this society he was of the opinion that the definition of normal occlusion was wrong in principle and wording. The definition was given as that occlusion which is within the standard deviations from the ideal. Standard deviations were found from the average by a mathematical formula, so that the average and the ideal must be the same thing, but in actual fact they were not the same thing. He would suggest that the definition of normal occlusion should be based on a morphologic standard for the molars and premolars, and on a biometrical standard for the overlap of the maxillary incisors over the mandibular. There was no morphologic mark to show how much the maxillary incisors should overlap the mandibular incisors, but this could be reduced to measurements. He would further suggest that the society should re-form its Nomenclature Committee, which should be given the task of examining the previous report, and of reporting to the Second International Orthodontic Congress. There is one other point, namely, as to the flush end of the second deciduous molars. Miss Smyth had made the matter very much clearer, and from her reconstructed drawings it was seen that at the contact points the second deciduous molars lay in the same vertical plane.

*Mr. H. C. Visick* desired to ask Miss Smyth whether she intended in the paper to give any reasons why the molars should rotate. He had read the paper before coming to the meeting, but he could see no reason given for the rotation of the maxillary molars mediolingually. If she had no reason to suggest, he would like to put forward the view that the rotation depended rather on the position of the apices of the roots. A case had been mentioned to the society in which the four second deciduous molars had been extracted at three and one-half or four years of age, and the four permanent molars had traveled forward and completely filled up the space, but in that case there was very little rotation. He thought the explanation why there was almost no rotation was because the roots had not been formed. Those four permanent molars were traveling forward between the age of four and six, and at that age the apices of the roots had not formed. On the other hand if the molars moved forward after the apices were fully formed, it became a tilting movement—the tooth hanging as it were from its apices. As the apex of the palatine root was distal to the apex of the anterior buccal root, the movement has to be inward as well as forward—giving an appearance of rotation.

*Mr. G. Northercroft* said he wanted to congratulate the author on the presentation of her paper. He wished that all slides shown at the meetings of the society were half as good. He did not know whether it was due to Miss Smyth's ingenuity that the base of the mandibular models had been cut out which admitted light on the lingual surfaces. That was an idea which he would certainly adopt. The speaker happened to be the chairman of the Nomenclature Committee which had been mentioned by Dr. Friel. The committee prepared its report for the first International Orthodontic Congress, and he himself fought tooth and nail for the term "ideal" without "normal" being introduced as the term to describe what had always been called normal occlusion. It was not normal occlusion, but it was ideal occlusion, and people were just now beginning to find that what he had contended for during the work of the Nomenclature Committee was the correct view after all. The present author had used the term "ideal normal"; she could not go quite the "whole hog" and say "ideal," she had to drag in the normal somewhere. For his own part he would welcome a second Nomenclature Committee for the second International Orthodontic Congress, the idea being that that committee should correct the errors of its predecessor, but it must have a different chairman.

With regard to the second point of controversy on which Dr. Friel had spoken, he might divulge the secret that Miss Smyth and himself were engaged on an investigation into the occlusion of a series of children from three to five years of age, and they hoped finally to dispose of this knotty question after viewing a hundred or so models. The models would be brought before the society, and members could take their choice. He might be wrong in his contention, or it was just possible, on the other hand, that Dr. Friel might be wrong, but he hoped that this matter would be decided to everybody's satisfaction in the course of the next year.

*Sir Norman Bennett* said that he had been very much impressed by Miss Smyth's paper; it had left his mind not entirely clear, but he had learned more in an hour about this subject than he had gathered for a long time. He supposed that the most frequent cause for forward movement of the molars was the loss of the second deciduous molar. Mr. Visick had asked Miss Smyth and the meeting to explain what was the reason why the rotation was usually mediolinguinal. The speaker had always assumed that it was due to the resistance of the long palatine root. If they knew what it was that moved the molar forward, they might know better why it moved in a particular direction. Did anybody know what made the molar move forward? He thought not. They were in the habit of calling it growth. They knew that if they opposed the resistance of a canine to the resistance of a molar and put equal pressure on the two, it was probably the molar that would move and not the canine; the canine would not move at all. A canine, so far as resistance went, was more than equal to the molar. It might be assumed, therefore, that it was length of root which was more important than anything else in this respect. If that was so, it was easy to understand that it was the resistance of the long palatine root which prevented the translational movement of the molar, and therefore the rotation was mediolinguinal.

*Mr. Harold Chapman* said, with reference to the etiology of molar rotations, that in some cases under treatment for enlargement of the arches, it had been his experience that he had a loss of space while treating the case. He thought there was some inherent tendency for small arches to remain small, and as soon as there was a chance for anything to go wrong, such as a space to close slightly, or a molar to rotate a little, that event occurred. He said, with reference to treatment, it had occurred to him that, instead of curling the spring round the arch, the free end of the spring could be made into a loop which engaged a spur directed medially on the arch. He had not tried it himself, but it seemed to him a very simple method of fixation. He had been specially pleased to notice that Miss Smyth gave some idea of the normal position of a permanent molar, from the point of view of rotation; this information had so far been lacking. Miss Smyth had spoken of a forward thrust; he asked how that forward thrust came about.

*Sir Norman Bennett* said that he thought he could reply to Mr. Chapman's last question, for the answer seemed to him obvious. There was a gain in spacing, the molar tooth moving backward, chiefly on the buccal aspect. At any rate, there was a rotation backward around the palatine root. If a tooth moved backward, it was because there was a force pushing it in that direction, and therefore there must be an equal and opposite thrust forward.

*Mrs. Lindsay* said that as Mr. Northcroft and Mr. Chapman had absolutely clamored for records, they ought now to be glowing with satisfaction at the mass of records in this paper. It was very seldom that the question of the developmental position of the first permanent molars was properly considered. If these were taken at the age of nine months the distance between the maxillary first permanent molars in the tuberosities was 21 mm.; the distance between the mandibular first permanent molars in the roots of the coronoid processes was 38 mm., and the distance between the first deciduous molar and the first permanent molar in the maxilla was 6 mm. and in the mandible 11 mm. Therefore the mandibular molar was 5 mm. behind the maxillary, and 8.5 mm. outside of it. Those relations were quite extraordinary when the distance the molars had to travel was considered, and it was not to be wondered at that very often what was called postnormal occlusion resulted. The occlusal surfaces of the maxillary and mandibular molars were also opposed to each other, the maxillary molar being inclined buccally downward and backward, and the mandibular molar forward, outward, and slightly inward. They were facing each other and, she supposed,

hoping to meet in six years' time. Sir Norman Bennett had already spoken about how they met eventually, but she thought that if a student who did not know anything about development came upon this paper he might imagine that the teeth were something like marbles in a pat of butter, growing down toward each other. Were the teeth passive objects or active objects? Was it the bone that moved the teeth or were the teeth moving in the bone? Both, of course. Mr. Lindsay had once suggested the analogy of a moving staircase on the Tube, the teeth being moved into position as a result of the movement of the "staircase," but possibly also themselves walking up the staircase and so arriving more quickly into position. The whole question was very complicated and obscure, but the subject was a fascinating one and one which she hoped would never be solved, because half the interest of the study would in that case be gone.

*Mr. Norman Gray* said that when he was in Philadelphia, Dr. Johnson urged him to study the rotation of the molars, saying that he would find it an aid to diagnosis. Miss Smyth had done a valuable piece of work in drawing attention again to this phenomenon, because it did help tremendously to notice this particular feature and it also simplified treatment a good deal. When he asked Dr. Johnson about the application of biologic principles, and suggested that he should give him a concrete case, Dr. Johnson replied that he thought the rotation of the molars was a big point. There were cases where a simple appliance could rotate the molars and save a great deal of treatment, perhaps even intermaxillary treatment, if the case could be got at a certain age.

*Mr. R. Lindsay* said that he had been inclined on first seeing the paper to wonder whether the question, "Is it worth while?" might not have been placed in front of it, and, certainly, even after reading the first part of her paper he was still inclined to ask that question. But when he heard her read the paper and saw her demonstration of the very excellent slides, he came to the conclusion that it must be worth while, and that the rotation of the permanent molar might be a very essential and important element of treatment in orthodontics. When looking at the Bronze Age skulls, he was inclined to think that particularly the adults were out of place in this series, because, so far as he could make out, the rotation which was shown in the teeth in many of those adult skulls was really due to the movement involved in heavy mastication performed by those teeth. Not only had the masticating surfaces been worn down, but the contact points had been destroyed and had become contact surfaces, and in the course of this excessive exercise there had been rotation movements in many of the teeth. In that respect the author had not got much support from her slides, but he thought all present would admit that she did get thorough support when she went on to deal with the young cases where the development in the erupting permanent molar was shown. It appeared to be a sign of the times that a woman should have used a corkscrew as an instrument in the elucidation of these cases, but he doubted whether the movement of the corkscrew did actually show the path of the developing tooth. With regard to the question of the forward push of the maxillary molars, as Mrs. Lindsay had just said, it showed that the tendency of the growth was downward and backward. That, indeed, must be evident from the development of the mandible.

*Miss Smyth*, in replying to the discussion, said the first point that Dr. Friel had referred to was the forward reaction of the springs. A thing that came into her mind was a remark of Mr. McKeag's in his paper, which he had also tried to instill into her personally—that to every action there was an equal and opposite reaction, and that applied to the spring which figured in her illustrations. But it was rather an unusual type of spring, because it was fixed at one end and sliding at the other. It slid forward on the bar, so that part of its reaction was lost, but it tended to thrust forward, and the forward movement was assisted by the natural forward movement of the molar. As to the question asked by Mr. Visick why molars moved forward, she could not say the reason why molars moved forward, any more than she could give the cause of eruption, but there seemed to be an inherent tendency in teeth to rotate. She did not know whether it was begging the question to bring in heredity, which was a sort of scapegoat for everything about which there was uncertainty. There did seem to be a tendency to rotate whenever the normal conditions were interfered with. She was interested in what Mr. Visick had said as to one of the factors influencing rotation

being the length of the roots of the teeth, and she thought that the amount of formation of the lingual roots in particular must have a great deal to do with the stability of the teeth. The ease which she had shown first of all moved through the bone at an early stage when there was no anchorage by the roots. With regard to nomenclature, she thought the Nomenclature Committee might also do something in regard to rotations. She had used the term "medio-lingual" and "mediobuccal" and soon, but these terms could not always have been clear, and she often found it very difficult herself to apportion the right term to the movement that she wished to describe. That would be a necessary task for a Nomenclature Committee. Mr. Visick had also said that she had talked so much more about maxillary rotation than about mandibular rotation. Mandibular rotations were fairly common, she had shown one or two, and there were others included in the models shown on the table. Most of the rotations in the mandibular were in the distobuccal direction, which was the developmental direction of that tooth, and showed the persistence of the developmental rotation. Over-rotation was not so common. Mr. Northeroft had mentioned the cutting of the models; but it was not her own idea. She thought that the cutting of the models in that way enabled one to see the lingual relationships better, the importance of which had been stressed by Dr. Schwarz, of Vienna. She was interested in Mr. Chapman's device for anchoring the spring. She had only that day been dealing with a spring which had come uncurled, whereas when one wanted to uncurl them it was a thing they stubbornly refused to do. Mrs. Lindsay had interested her by her remarks on the developmental positions of the teeth. She felt that a whole paper might be read on the developmental position of the teeth, and she could only touch on the merest fringe of the subject. But just at the last moment before completing her paper, she had received the interesting x-ray picture from Dr. Schwarz who had been working on the same point, and she felt inspired to find out some more about the developmental position of the molars. Dr. Schwarz in his essay spoke of the "urge" of the teeth to meet one another, and the phrase recalled itself to her when she heard Mrs. Lindsay speak of the teeth which "hoped to meet later on." The teeth were not just hung up in the blue, so to speak, they had a definite mission in life to meet each other. She had been extremely gratified by the remarks of Mr. Lindsay that it was worth while from the practical point of view to undertake this work. If one treated a postnormal case showing abnormal rotation of molars without rotating them, and a similar case in conjunction with rotation, one was no longer in doubt that rotation was worth while. With regard to the ancient skulls, she quite agreed that in a great many of these cases the factor which had helped to bring about rotation was wear and not occlusal conditions, but one or two of the examples were definitely associated with abnormality in the shape of the other teeth.

## A SURVEY OF PROPHYLACTIC DENTISTRY, CONCLUSIONS THEREFROM, A SUGGESTION FOR THE MINIMIZING OF FUTURE DENTAL CARIES, AND A PLEA FOR INTELLIGENT CONCERTED ACTION\*

BY SAMUEL ABRAHAM, PH.C., D.D.S., NEW YORK, N. Y.

All rivers run into the sea, yet the sea is not full;  
Unto the place whither the rivers go,  
Thither they go again.  
All things toil to weariness;  
Man cannot utter it,  
The eye is not satisfied with seeing;  
Nor the ear filled with hearing.  
That which hath been done, is that which shall be done;  
And there is nothing new under the sun.  
Is there a thing whereof it is said  
"See, this is new"?—it hath been already, in the ages  
which were before us.

THESE words of wisdom, although written several thousand years ago, are just another way of telling you, in the inspiring words of the wise men of old, that no originality is claimed for any statement herein. I want at the outset to ask your pardon for the time that this paper will consume and for the effrontery on my part in presenting so serious an essay at a time which is usually given to mirth, as has always been the wont at our annual meetings. My subject for this evening is an old one, but until its accomplishment is an actual reality it promises to be the foremost subject for consideration before the dental profession. As you probably surmise, my reference is to *prophylactic dentistry*.

Prophylactic dentistry includes the use of those agencies which minimize or eliminate those forces which make for dental disease.

That this subject is not new is gleaned from the archives of excavations of the Egyptians recording items pretending to dental prophylaxis. From the time of the famous Ebers Papyrus, estimated to be written 5700 years ago, until the present date, the literature reflects the current knowledge of the era in which it was written.

Although the last word on this subject has been written several times, caries seems to be just as prevalent and perhaps more so than it was at any time since our history records.

Coming down to the beginnings in dentistry, I take the liberty to quote from textbooks which we studied in 1910, in order to refresh our memories on the subject of dental caries and microscopic anatomy of the teeth and compare it with more recent discoveries and theories.

\*President's Report to the Columbia Study Club of Advanced Dental Science, at its annual meeting held in New York City, April 24, 1930.

**Quoting Johnson:**

"Certain writers have held the theory that inflammation or gangrene played a part in the breaking down of the tooth tissue, that the character of the tooth structure itself was the most significant thing connected with it, and that the *disease progressed from within outward*. Others thought that while the disease began *upon the surface of the tooth and progressed inwardly*, it was due chiefly to the chemical reaction of the saliva, etc." (Italics are mine.)

John Tomes, a little later announced his discovery that Blue Litmus paper is turned red when placed in a carious cavity, thus establishing the fact that the process is chemical and acid in reaction.

In 1881, Miller demonstrated that caries was due to the formation of acid brought about by microorganic growth in the mouth. The findings of Miller, which demonstrated chemicoparasitic action locally, have stood the test of investigations since then.

A few years later, Williams and Black called attention to the formation of gelatinous plaques on the surface of the enamel under which the microorganism may produce its acid in concentrated form and attack the enamel undisturbed by external influence.

Even in the early days, Miller's theory was given secondary consideration to constitutional and environmental factors.

Concerning the development of enamel I quote from Turner who stated in 1910:

"When a tooth is erupted the enamel is entirely completed over the whole of its crown. No portion of the tooth is erupted until the enamel covering it is fully formed. When once formed, enamel is a completed substance, and no physiologic change in its structure or composition ever occurs thereafter."

Curiously enough, in the February, 1930, issue of the *Dental Cosmos*, Professor Stein of the New York University Dental School expresses practically the same thoughts and opinions taught us in the older textbooks. He states:

"The enamel is to be looked upon as a calcified or petrified nonnucleated cylindrical epithelial unit."

"Its inertness needs no comment," is the comment of no less an authority than Hopewell Smith concerning human enamel.

Contrasting the above statements with careful investigations of Kato, Bodecker, Howe and a host of others, to me at least, a different picture presents itself.

Kato, in a recent series of articles (*Dental Cosmos*, 1929-1930) concludes:

"By aid of vital staining injections of five per cent lithium-carmine solution into abdominal cavities of cats and a mixture of saturated thionin solution in fifty per cent alcohol into mice and divers other injection staining, I examined the metabolic condition of enamel and the following mentioned aspects were evidently proved:

- "(1) Gradual change of enamel tubuli in accordance with advance in age.
- "(2) Increase of iron in enamel in accordance with advance in age.
- "(3) Increase in hardness of enamel in accordance with advance in age.

"(4) Superiority in hardness of enamel of teeth with vital pulps to that of teeth with dead pulps.

"These proofs, combined with many other examinations, induce me to believe in the operation of metabolism in enamel being performed by enamel fibrillae, the terminals of dentinal fibrillae being continuous with the dental pulp."

Kato holds that the enamel tissue composite is (1) enamel matrix, (2) enamel tubules, (3) enamel fibrillae and (4) enamel tubule sheath. He further states that the enamel tubules are connected with dentinal tubules at the dentino-enamel junction, and terminate in Nasmyth's membrane on the external side.

Kato's work is further substantiated by Bodecker whose investigations are in accord with Head, Andresen, Beust, Bunting and Rickert, Amberson, Klein, and proves that the enamel is permeable.

Fish's ingenious experiment on dogs is most illuminating. These experiments were undertaken on the teeth of not only young dogs but also old ones, conclusively proving the permeability of both the dentin and the enamel in the long erupted teeth of dogs.

The investigations of Percy Howe in demonstrating the presence of lead in the dentin and enamel of the tooth of an individual who died of lead poisoning further shows the permeability during the life of these structures.

Let us digress for a while and discuss the ingredients which not only enter into the formation of the enamel but also are probably vital for its sustenance. Diet is the all important consideration. Hopkins, Funck, McCollum, among the pioneers, and more recently Howe, Mellanby and Lennox have amply demonstrated that foods which cover the individual's protein and caloric requirements must continually be supplemented by a liberal supply of vitamins and mineral salts.

Only in this way can the individual tissues, which include of course the teeth and supporting structures, be adequately formed and sustained; in other words, not only must the foods ingested daily contain an adequate supply of calcium and phosphorus and other essential elements which enter into tooth structure, but these must also be supplemented by factors which are favorable for their assimilation, viz., vitamins A, B, C, and D, also perhaps such factors as sunlight and other agents which make for good hygiene. In addition to diet, it must also be borne in mind that chemical experience has amply demonstrated the fact that disease or any other factors that alter metabolism can and do interfere with the formation and maintenance of the normal metabolism of tooth structure.

Returning now to clinical dentistry, I do not have to remind you that tissues are merely cells and intercellular substances.

A cell is the unit of life. Claude Bernard calls it an elementary organism. It is a morphologic and physiologic unit. In order to function to best advantage, nature has provided an environment which is best suited to its physiologic activities and developments, viz., proper nutriment, proper waste

disposal, proper physical conditions and proper innervation. Any deviation from these proper environmental conditions will result in disease and ultimate death to the cells.

Our body is a very complex organism made up of organs which function coordinately. Each organ is made up of cells especially modified to meet the peculiar requirements of the particular function of the organ of which it is a part. In order to sustain life, we are subject to the same environmental conditions necessary to the life of the cell. Proper nutriment is the first of these requisites. In order that our organs may function physiologically, the cells which go to make up the organs must be properly nourished. Anything which interferes with the nutrition of the cell will cause disease and ultimate death to the cell.

In the case of pits and fissures on the occlusal surfaces of premolars and molars, we have an anatomic imperfection caused by a noncoalescence of the enamel lobes or developmental center of ossification of the tooth. Because of this lack of coalescence, whatever the cause, the circulation to this part of the tooth is incomplete or insufficient to nourish the cells properly. Hence, it must follow that if the circulation to the part is interfered with, we have a vulnerable spot for caries to develop. Clinically speaking, if the tooth is *completely* calcified before it is erupted, no fissures will be present. It is fully ripened or matured. On the other hand, if fissures are present, it is because the tooth erupted immaturely, that is, the various lobes have failed to coalesce or join together to form a continuous surface. This imperfection is termed a fissure; these fissures are the vulnerable spots for caries to develop.

Enamel fissures are very common on the occlusal surfaces of molars and premolars. Hyatt has given us very reliable statistics which show that at least 74 per cent of all newly erupted molars have enamel fissures on their occlusal surfaces.

Following the idea that occlusal fissures are caused by immature eruption and that the process of ossification is arrested at the time of eruption because of being exposed to an unfavorable environment, the thought occurred that the process of calcification would continue after the eruption of an immature tooth if the occlusal surfaces were protected from external influences.

For the past several years, this has been attempted by placing on the occlusal surface a cement filling, and thus hermetically sealing the fissures, allowing time and nature to complete the calcification.

The technic which I have used is briefly described as follows: The occlusal surface of the tooth is first thoroughly cleansed with a mild abrasive preparation and a stiff wheel bristle brush, and then thoroughly sprayed and washed with Dakin's saline solution. The tooth is then isolated by means of dental napkins or cotton rolls. The occlusal surface is now thoroughly dried, and some soft modeling compound is pressed over the occlusal surface of the tooth, sufficiently hard to give a clear impression of the occlusal surface only. This compound is removed and chilled, and the elevations in the compound (which represent the deep sulci) are scraped away gently with a lancet and

the compound again chilled with cold air. If again pressed to place, the compound will leave a minute space between the fissure and the compound. This space will later be occupied by cement. The compound impression is now oiled with a drop of mineral oil or vaseline. The tooth then receives a drop of 5 per cent solution of silver nitrate, which is rubbed into the grooves by means of a pellet of cotton. This is followed by a pellet of cotton saturated with 7 per cent tincture of iodin, and this in turn is followed by a dry pellet of cotton to absorb the medicaments on the tooth surface. The surface is then covered with a medium mix of silver phosphate cement, which is pressed home by means of the modeling compound impression. This is held firmly in position for a minute or two, after which the excess cement is scraped away with suitable burnishers.

Care must be taken that this prophylactic filling does not in any way interfere with the occlusion. These prophylactic cement fillings require no drilling into the enamel and are *in situ* from three months to three years. It is advisable to renew them if they have washed away during the interim between examinations, which should take place at intervals varying from three to six months.

In conclusion, I should like to give full credit to the dental profession for the marvelous advancements made in dental science. Dentistry has made tremendous strides and, I believe, has placed itself in an enviable position alongside of its brothers of the healing art. The major part of our progress, if it can be called progress, has been accomplished along restorative lines, that is, after the damage has already manifested itself. We have perfected filling materials, we have improved inlay restorations, we have advanced porcelain tooth restorations, we have perfected removable bridgework and denture work. But we have made very little progress along the line of prophylactic dentistry.

As a bold suggestion from one who has been honored by you to be your president for the past two years, I hope that this study club will dedicate itself to concentrate its major efforts to the prevention of dental caries.

Knowing that individually or even collectively very little progress may be made toward this goal, nevertheless by combining our forces and keeping records and reporting results of our observations, this organization will justify its existence as a study club.

As a parting thought, I would like to quote a few words from Lowell:

“Daily with souls that eringe and plot,  
We Sinais climb and know it not.”

## MUSCLE TRAINING\*

### A CASE REPORT

BY HARRY L. LOGAN, Mt. CARMEL, PA.

IT HAS been said of short story writing that after a narrative is well written it is only halfway on the road to publication. The next step, and the more difficult one, is to get the publisher to print the story. In like manner, the more tantalizing problem of muscle culture is "to get the children to do the exercise."



Fig. 1.

Muscle training, unlike any other orthodontic technic, discloses no evidence whereby we can check up on accuracy. We can see at once if a finger spring is functioning, but we have no such visible proof that a child is exercising, none other than the parent's statement and that is not always reliable.

The science of muscle culture as taught by Dr. Rogers represents a highly efficient adjunct to mechanical treatment in which the operator, parents, and patient must all do their part, all working together in orderly sequence toward a successful result. Most of us endeavor to sidestep the trials, experiences and discouragements that he (Dr. Rogers) must have had,

\*Read before the Alumni Society of the Dewey School of Orthodontia, Oct. 27, 28, 29, 1930.

and expect with one "gulp" to master it in its entirety. If we could confine our investigations and experiments to one class of malocclusion, accepting the challenges, overcoming the difficulties characteristic of that class, I am sure the fundamentals of this science of orthodontia would begin to unfold to our great delight and understanding.

I have selected for this case report one case with a familiar facial deformity, pictured in Fig. 1. These cases may differ as to classification and etiology but are identical in that the lips are full and without tone or normal function. The maxillary teeth are protruded, the mandibular anteriors retracted with the mandibular lip sandwiched between the teeth, making an abnormality that is progressive. I fail to see how we can maintain a correct occlusion unless we restore normal function to the muscles and I know of no restorative measures other than the systematic exercise on the part of the patient and eternal vigilance by the operator.

The patient in Fig. 1 is painfully conscious that her lips are not just right. She has been told "your lips are so big and puffy" or "do not sit



Fig. 2.

with such a stupid expression," and this very consciousness is an incentive for a child to cooperate so that "her face will become pretty." The child should be constantly reminded of these facts in a tactful and gracious manner.

The case under consideration is illustrated in Fig. 2. It shows the maxillary arch before treatment, narrow and tapered, with incisors separated and partly rotated; a typical maxillary arch associated with functionless lips.

Fig. 3 reveals the same arch six months after faithful performance of the prescribed exercises. The incisors are returning to a more normal alignment, approximal contact is established, and the entire arch has assumed a more graceful curve. The only mechanical appliance used was for mandibular tooth movement.

The specific exercise used by this girl may best be described by following ourselves before a mirror. With the teeth in centric occlusion, the lips are first drawn to a pucker until they have assumed their shortest circumference. In this position all the fibers of the lips are fully contracted while the radiating muscles are extended. If one but maintains this position even

for a short time, a fatigue will be detected in even the remote temporal muscle. The pucker is held for five seconds.

The second movement with teeth still in occlusion, we spread the orbicularis until the lips have attained their extreme horizontal length; what we may call a broad grin. This position creates an elongation of all the lip fibers and a consequent contraction of the radiating muscles. Once more,



Fig. 3.

and still before our mirror, we follow these exercises: first the pucker held for five seconds, then the broad grin for another five seconds, and repeat these movements rhythmically twenty-five times.

This exercise of the pucker and broad grin was performed twenty-five times each, preceding meals. The number was gradually increased until she was performing several hundred times a day without fatigue. To obtain the best results and cooperation a trained technician or assistant should have full charge of these exercises and assume the responsibility.

## MUSCLE TRAINING\*

BY A. W. CROSBY, D.D.S., NEW HAVEN, CONN.

MUSCLE training is a rather comprehensive subject. I have to choose what I am to talk about carefully because Dr. Rogers and others from time to time have been giving papers and have brought out many phases and advantages of muscle training. I am taking an angle that has not been so much stressed in this connection.

We are all aware that it is necessary to remove interference before we can begin to think of retention and a finished case. It occurs to me immediately that there are two types of interference. In one case it is a matter of cusps and in the other of pernicious habits. Class I malocclusions present numerous propping and sleeping habits assumed by the individual, which if not actually producing the malocclusions are certainly abetting them and thereby making treatment more difficult and prolonged; and if, as a matter of fact, they are not eliminated spontaneously or through attention, they will make it impossible to retain whatever development we may have gained. If the patient lies habitually on his stomach with the hand under one cheek, he never will achieve an approximately normal cusping on the affected side, which would make the masseter-temporal exercises effective.

Dr. Stallard has called attention to the fact that there are a great many more subdivisions of Classes II and III than there are full divisions, and observation bears this out. He further says if this is so, then the principal etiologic factor cannot be mouth-breathing and we must look for some other cause and it is usually not difficult to find some habit which is producing this particular type of deformity.

We have abundant evidence in Class I cases that propping with the elbow on the table, or arm of the chair, with the knuckles in the cheek, or sleeping with the arm, hand or doubled-up fist under cheek, will cause the arches, especially the upper one, to assume either a saddle or lancet shape. The form depends on whether the pressure is located in the center of the buccal portion of the arch, or is a broad pressure, as lying on the arm or flattened hand is known to produce a generally flattened, lancet shaped arch.

Buccal appliances are an advantage in these cases because pressure of the buccal tissues against the arches will make these tissues sore. All you have to tell the patient in cases where the arches are well adjusted is, not to sleep with the arms or hands under the cheek and the soreness will disappear. It is important that a substitute position for the arms be suggested and the patient told that this will soon be as natural as the old one.

In Class II cases, sleeping on the stomach with the hand under the cheek or even under the pillow or bunching up the bed clothing and holding it

\*Read before the New York Society of Orthodontists, Hotel Commodore, New York City, Nov. 24, 1930.

against the cheek will do much the same thing. It is just as harmful to sleep with the head resting on the hunched-up shoulder. Most propping habits, where the pressure comes against the mandible, will do the same thing; namely, displace the arch distally on the side opposite that upon which the pressure is exerted. Occasionally the displacement is bilateral, but not often.

In Class III, lying with the arm in such a position that it will bring a pressure back of the angle of the ramus will force the mandible forward. This is the result too of lying with the fist in the subauricular fossa. Attention has been called to the fact that bones of some children seem to be more susceptible to pressure than those of others. Plenty of outdoor play, sunshine, and an abundance of milk, fruit and vegetables, especially fresh ones, will help this condition.

We may blame heredity or environment, but nevertheless we are called on to correct lack of adequate development and perverted development.

Dewey, Hellman, Brash, Todd and others have convincingly shown that various bones, or at least areas in these bones, of the face show spurts of growth at different times and in different directions at successive stages of growth. If we are alert and have the opportunity, we shall try to make use of these regional spurts of growth. Suppose something goes wrong with this development; shall we confine our efforts to mechanical appliances, or shall we recognize that there is a necessity for developing muscle function where it is inadequate, to try to secure needed bone development and make it a good and *permanent* development?

The limited experience I have had with these auxiliaries to pure mechanical apparatus, aptly called by Dr. Rogers "Nature's Orthodontic Appliances," has persuaded me again to call attention to this important field in dental orthopedics. The descriptions of the several groups of muscles, given by Dr. Rogers, are so well known and are so readily available that I shall not dwell on them but strongly recommend that you read all articles again.

The war, especially, taught us that it is quite as important to train muscles and to re-establish function as to repair the parts maimed. The remarkable part is that very little apparatus is required, in most cases none. The only ones Rogers suggests besides the orbicularis exerciser are the straps made of several plys of stout linen sewed together, with a rib sewed on for each case to make the grip effective in engaging the anterior teeth. The tugging on this strap by parent or nurse is correct practice and founded on a very practical principle.

There is one more, if it can properly be called apparatus for it is so light. If you have tried placing the corner of a piece of cardboard, the thickness of a visiting card, between the lips to keep them closed habitually, you have certainly noticed that there is no muscle strain and that the lip muscles lie very becomingly against the teeth. This is the simplest way to form the habit of keeping the lips closed one can imagine. Like all other exercises, active or passive, the successful outcome depends upon the regularity and faithfulness with which it is used. If employed several hours each day, and some patients seem to like the idea, it will not take many months to train these muscles to

function normally. You will be pleased to see what a pleasant expression will be habitual with them.

There have been in my experience some cases where the masseter-temporal exercise will not close the bite. Notably in the type where the deciduous molars, before the time they should be shed, have actually or apparently grown shorter, half or less of the crown showing above the gum line. The same thing occurs later in the premolars. At times no amount of persuasion with auxiliary springs will make them move; and if they do, they promptly try to disappear again as soon as the pressure is released. Why is it that the bone is so reluctant to grow?

In such cases I have very gratifying results when Dr. Ferris' Odonto-bell is used. They *can* be persuaded to come together and *stay* in occlusion. I shall show a case where after prolonged treatment I had not been at all successful. The rubber dumb-bell did the trick. It is also useful in treating open-bite in the anterior teeth and in improving the vertical angles of teeth. After treatment there is usually a something, often almost intangible, which reveals to the initiated, at least, that the case has been treated for malocclusions. In such cases masseter-temporal exercises will help to settle the cusps into occlusion and improve the general tone of all regions. The Odonto-bell is useful, too, in encouraging general development but is of special value when there are particular parts of the arch to be developed. Some children will work better with the Odonto-bell, requiring less supervision. They seem to get a certain satisfaction in chewing on this yielding substance. The resiliency in the rubber Dr. Ferris has been able to secure will certainly show results in half the time it formerly took when we were using the rubber cord.

There is one warning I feel impelled to give and that is to make radiographs of the third molar region for all patients over fourteen years of age. My experience has been that vigorous exercise of the masseter-temporal group has on occasion opened the bite when the third molars have been definitely impacted.

I wish to show you a film of Dr. Dreyfus, Lausanne, Switzerland, shown in 1927 at the meeting of the European Orthodontological Society in London. Some of you have seen it before but with the chief thought being—what is the most effective nipple to use? Now I want you to look at it with the interest centered on the notable functioning of the muscles in this earliest means of securing nourishment.

The next important stage is, of course, when the child is being weaned. Food requiring use of the muscles of mastication should be introduced early because if habits of mastication and a desire for foods requiring vigorous functioning of these muscles are not introduced early the child will shirk all but soft foods.

(Slides were shown.)

In closing let me say that the teaching of muscle exercises to our patients can only be as successful as our personal belief in them, and we must impress the patient to the extent that he will do the exercises, whether by himself or under competent supervision, with the utmost faith in the outcome.

It is probably true, that no matter how intimate our knowledge of child psychology, we shall not be able to get 100 per cent cooperation, but we shall get sufficient to do much good. We should not be discouraged if there are occasional failures in getting full cooperation. Socrates, when asked if he was not disheartened that a greater number of his pupils did not prove worthy of his teachings, replied in substance—If one in twenty responds I feel that what I have taught is not in vain.

## THE NEW WIPLA ORTHODONTIC APPLIANCE\*

BY DR. JACOBSHAGEN, BERLIN, GERMANY

I AM about to show you a film which will not only give you an insight into the construction of the new Wipla appliance, but which will also give you a survey of Dr. Simon's system of Wipla spring-beam appliance. Although this is not a film which will show you all phases of the work to the smallest detail (such a film would take too much time for this meeting), still I believe all of you who are interested in orthodontics, after having seen this film, read the pamphlets concerning it, and when you have had the necessary experience through your own laboratory work, you will be able to make use of this appliance now and then in your practice.

Every practitioner who considers the comfort of his patients in regard to the progress of treatment and his own comfort in regard to the simplicity and economy of the appliance used, should not fail to consider the advantages of this method.

The qualities of this metal are not only as good as gold-platinum, but are still better, for although the diameter of the spring-arch is only 0.7 mm., and that of the finger spring 0.5 mm., the elasticity of the Wipla wire is 100 per cent.

Wipla metal does not collect dirt, and cannot oxydize as is the case with gold-platinum alloys.

Another important advantage is the extraordinary cheapness of the materials: a roll of Wipla wire three meters long costs 2s., irrespective of the diameter, and as twelve spring-arches can be made from one roll of Wipla wire, each spring-arch costs only 2d. Further, consider the simplicity of manufacture; you will see that the whole appliance can be made almost entirely with the use of one pair of pointed pliers, and in at least as short a time as any other appliance can be made in any other metal.

Further, I wish to call your attention to the fact that this appliance contains no screws, that it works entirely by spring pressure, which is consistent with our latest biologic knowledge.

In conclusion, I wish to say that there is no appliance so inconspicuous as this.

## REPORT OF OPEN-BITE CASE\*

BY NORRIS C. LEONARD, D.D.S., BALTIMORE, MD.

**I**N OFFERING this case report at the request of the committee I do so in the belief that it exemplifies a neglected principle that may have considerable value in the treatment of open-bite.

It is to the application of this principle, with a suggestion of its possibilities in practice, rather than any specific case, to which I invite your attention.

The fundamental truth which I wish to impress is that any constant and sustained increase of muscular stress beyond the normal physiologic balance, when functionally applied to the teeth in an axial direction, will to some degree change the relative position of the occlusal plane, either by forcing the teeth deeper into the alveoli, or by lifting them farther out.

This I believe is already fairly well established, and when clearly stated and understood may come to be recognized in our specialty as axiomatic.

If this be true, as it seems, the importance of the principle, if it may be practically applied, becomes obvious, for the treatment of both open-bite and its antithesis overbite.

To illustrate the constancy of this principle, functionally applied in depressing the buccal teeth, I am showing you a few illustrations (Figs. 1, 2, and 3) of typical results obtained in a series of about thirty cases in which overlays opening the bite two or three millimeters were used for an entirely different purpose. In every case of this series, however, without a single exception, irrespective of the number of teeth included or whether the overlays were applied unilaterally or bilaterally, all the buccal teeth to which they were attached and the opposing ones with which they occluded were depressed in their sockets within a few weeks, to the extent of the thickness of the overlays, and the consequent restoration of normal muscular balance.

None of this series, however, were open-bite cases; and it is conceivable, in fact quite probable, that in a considerable proportion of the latter class, there may be some inherent qualities of the bones and musculature, or their relation to each other, that would modify such pronounced response to so slight an increase in muscular tension.

This is one of the problems I may only suggest and cannot attempt to discuss in the very limited time allotted to me. In fact my observation has been so limited in this particular field and my study so superficial that my opinions could be of little value. I only feel that in dealing with open-bite cases, orthodontia is facing one of its biggest problems; and while in most cases the etiology is obscure and perhaps involved with endocrine irregularity, we are not yet ready to acknowledge defeat or to justify our failures with soothing biologic platitudes.

\*Presented before the New York Society of Orthodontists, Hotel Commodore, New York City, Nov. 24, 1930.

We should, I feel, concern ourselves more with the study of etiology, with a view to finding out more about its incipient stages and to determining the most favorable time to institute treatment.

Better methods of diagnosis, in which Dr. Howard has already pointed the way, should aid greatly in determining the correct relative position of the occlusal plane and more intelligent selection of a method of treatment.

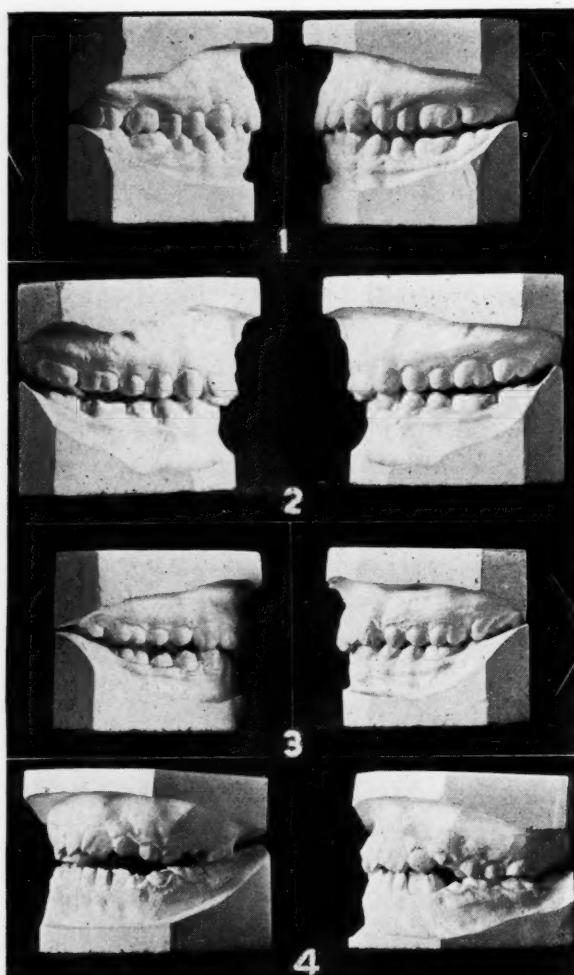


Fig. 1.—Unilateral depression of molar and premolars from a device with sliding top attached to buccal teeth to correct unilateral distoclusion. These teeth came slowly into full occlusion after the removal of the appliance.

Fig. 2.—A case of bilateral distoclusion, showing depression of two molars and premolars from the application of the sliding top device attached to the mandibular buccal teeth. Both sides depressed alike. Patient is fifteen years old.

Fig. 3.—Case similar to that shown in Fig. 1.

Fig. 4.—Case of open-bite in a girl eight and one-half years old, treated with overlay in the form of shell crowns on the two maxillary first permanent molars, the cusp portion being cast thick enough to increase open-bite about 2 mm., and formed with occlusal portion adapted for functional contacts with the mandibular first permanent molars. Appliance was worn about eight months. There was no tendency to relapse after a six-month interval without appliances of any kind, and an additional six months of further treatment for corrections in the incisal regions.

The principle employed in the treatment of the following case, that is, utilizing the gentle elastic force of the soft tissues under slightly increased tension, to depress the molars, where the diagnosis indicated supraversion in

this region, will work equally well when applied in reverse in cases of open-bite due to infraversion of the anterior segment of the arch.

The patient, a girl, was first seen and models were made at the age of eight and a half years; health good, teeth in good condition, with both arches narrow, mandibular arch slightly distal in occlusion; first permanent molars erupted but not yet in occlusion. Anterior teeth of both arches were well erupted though crowded and slightly rotated, with the maxillary incisors displaced mesially, and the mandibular incisors slightly tipped distally, leaving a considerable open space in the incisal region.

The patient when very young had sucked her thumb, but this habit had been discontinued at the age of four years. No forward tongue habit could be elicited, though there was apparent a habit of holding the tongue very far distal, particularly when talking. Fine development about the nares indicated free nasal breathing.

At that time a definite indication to open-bite was noted and called to the attention of the parents.

#### TREATMENT

Both arches were slowly widened by means of lingual appliances anchored to the second deciduous molars.

At the age of ten and a half years the permanent first molars had come into occlusion and were opening the bite still farther, leaving the deciduous molars out of occlusion on both sides.

At this time treatment for reducing the open-bite was begun. Bands for the maxillary first permanent molars, which were in supraclusion, were made, with cast overlays about two millimeters in thickness extending over the occlusal surfaces of these two teeth, and increasing the open-bite to this extent.

These bands with the overlay cusps and occlusal portion, like shell crowns, were left in place for about eight months with very little attention, though during a part of this time some little adjustments were made to the incisors through the means of a labial appliance attached to the molar bands.

When these bands (or shell crowns with thick occlusal portion) were removed, it was found that the open-bite condition had been reduced to the extent shown in the models (Fig. 4).

Impressions for these models were made after a six months' interval during which no appliances whatever were worn. No tendency up to the present time, four months later, has been shown toward a return to open-bite, and the case is now under treatment for the correction of other conditions.

There was not at any time while the overlays were being worn the slightest soreness in the teeth to which the overlays were attached or in those with which they occluded.

## REPORT OF OPEN-BITE CASE\*

BY HARRY E. KELSEY, D.D.S., F.A.C.D., BALTIMORE, MD.

THE patient was a young man nineteen years of age. (Fig. 1.) There was a prognathous tendency which was aggravated by extreme lack of development, both laterally and anteriorly in the maxillary arch. This lack of development was reflected in the complete labial malposition of the canines, giving the appearance generally known among the laity as tusks. The maxillary incisors were slightly distal to the mandibular.

Despite this lack of development the third molars were erupting in both dental arches, and this eruption has since been completed. There was scarcely any open-bite at this time. The open-bite developed later as the arches, es-

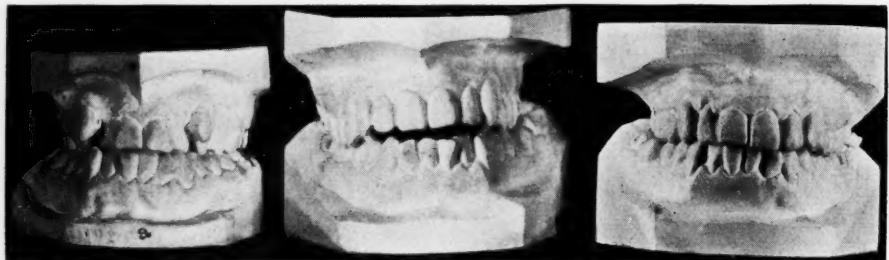


Fig. 1.

Fig. 2.

Fig. 3.

Fig. 1.—Case before treatment.

Fig. 2.—Open-bite as it appeared after widening and correcting the alignment of the arches.

Fig. 3.—Two years after all active treatment had been discontinued. Open-bite fully corrected.

pecially the maxillary one, were enlarged. When space enough had been gained to accommodate the maxillary canines, the open-bite had reached the point shown in Fig. 2. Some of this was due to somewhat different relation of the molars and premolars, probably a little elongation of molars, and the rest to the tipping forward of the maxillary incisor teeth.

At this stage I retained the case for some months making no effort to close the bite, hoping it would settle down. Perhaps it would be in two or three years, but the patient could not wait that long. I, therefore, resorted to the chin and head cap, which I had used with varying success in other cases. Generally the results were not very satisfactory, but Dr. Clinton C. Howard's description<sup>1</sup> of his method of using the chin and head cap and the success attending a case, which he reported before the Southern Society of Orthodontists four or five years ago, inspired me with new hope. The reaction was slow, however, until I put labial arches above and below, attach-

\*Read at the meeting of the New York Society of Orthodontists, New York City, November, 24, 1930.

ment to the teeth being provided by ligatures, and applied direct intermaxillary elastics. The chin and skull cap was worn at night only, but the intermaxillary elastics were worn constantly, except when eating or brushing the teeth.

At the end of ten months the open-bite had been corrected and a slight overlap secured, and the angle of inclination of the maxillary incisors had been much improved. The intermaxillary appliances were then removed, and a simple palatal retaining plate was inserted above, and I had the patient begin the use of the rubber dumb-bells, recommended by Dr. H. C. Ferris, the chin and skull cap being continued with as strong elastics as the patient could comfortably wear. To my great satisfaction, there was no relapse. After about a year, the chin and skull cap was discontinued. However, I had the patient continue to wear the palatal retaining plate at night, and Fig. 3 shows present condition two years after active treatment was discontinued. The overbite is very slowly increasing, and I feel that the treatment was successful.

I have seldom had a more appreciative patient. He was discouraged throughout by his dentist, who said the overbite could never be corrected, and if by any chance it were corrected, there would be a relapse. The right lateral incisor had a tendency to drop lingually, and for this reason the retaining plate was built up slightly behind it and the patient continues to wear it.

The chin and head cap, I feel, is an excellent adjunct to treatment but is very slow in its action unless rather powerful elastics can be used. Some patients will wear quite strong ones, others will not, or complain of headache and pains in the face and temporomandibular joint, and also in the region of the chin, due to the pressure on the soft tissues, but it is a most useful adjunct to other appliances and most helpful as a retaining appliance. Worn constantly and with strong elastics, almost anything might be accomplished.

As to etiology, the case was one with faint tendency toward open-bite, and this was greatly exaggerated by the treatment to enlarge the arches. I do not present this case as evidence that open-bite cases with a different etiology can be successfully treated, although I know from experience that some can, providing the cause is removed.

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ORAL SURGERY, ORAL PATHOLOGY  
AND SURGICAL ORTHODONTIA**

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**MIRAUTL OPERATION FOR SINGLE HARELIP\***

BY VILRAY P. BLAIR, M.D., F.A.C.S., AND J. B. BROWN, M.D., ST. LOUIS, Mo.

**E**ACH year in the United States approximately one thousand children are born with more or less complete patency of the lower part of the primitive frontomaxillary fissure. In the great majority of these children sufficient tissue is present, if properly used, to permit of an acceptable surgical repair. At least this is true of the defects of the lip and nose.

Because the lip defects are apparently simple clefts and because much of the dicta on their repair has inclined toward triteness, many surgeons have fallen into the gross error of thinking that the repair is easy, hardly worthy of special effort. Yet, in spite of these facts, in few other surgical situations are evident possibilities and average accomplishment so far apart.

The correction of such defects is more or less simple, but it is a simplicity that is attained only by grinding effort. Though these open clefts differ much in appearance in various cases, their individual differences are more of degree than of kind, so that any one of several operative plans can be made applicable to the ordinary case. If he learns to use any one of the standard methods, the surgeon who assays the correction of nose and lip defects will expend his energy to greater profit than if he attempts to exercise eclecticism, or more dangerous yet, to contrive new methods. It is true that operative skill rather than breadth of acquaintance will bring greater satisfaction to the patient thus afflicted. This statement is made with no intention of belittling invention or ingenuity but rather to urge that these qualifications be directed, in the case in hand, toward adapting some well tried out plan. As a rule the simple plans are easier to execute but they are less plastic. Every added complexity of technic is a distraction and is justified only by commensurate added possibilities. Before adopting the more complex methods, therefore, the operator should make himself familiar with every detail

\*From the Department of Surgery, Washington University.

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of the operation and should understand the logic for doing it. As the operator acquires more skill, he may feel justified in adopting a method that in earlier days he considered less feasible, but each modification will be like changing a golf stroke—not always free from immediate grief.

After the surgeon has gained the greatest possible surgical and mechanical skill with the most congenial method, he may still find that the results

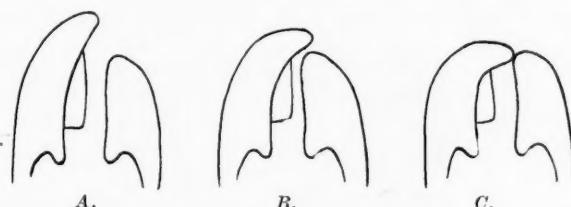


Fig. 1.—Replacement of the premaxilla. *A*, Diagram of an open, complete single cleft. *B* shows desired relationship of the premaxilla to the maxilla in the closure of the alveolar cleft. This gives the greatest prominence to the upper lip and least width to the anterior part of the palate cleft. Such a relationship usually follows within 3 to 15 months after a simple repair of the lip over the open alveolar cleft. *C* shows an improper adjustment of the premaxilla to the maxilla, resulting from misdirected force. It causes retraction of the upper lip and an increased width in the anterior part of the cleft palate. See also Figs. 6, 7, and 8.

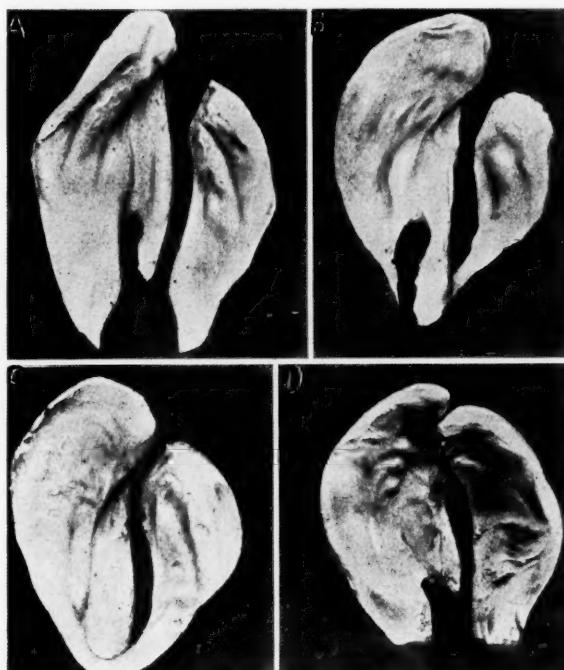


Fig. 2.—Shows the closure of the alveolar part of the cleft that will usually occur when the lip is repaired. *A* is a cast made of a cleft palate in a child 20 weeks old. At this age it is not good practice forcefully to close the alveolar part of the cleft, but the lip is repaired. The other three casts were made at 23, 30, and 44 weeks, respectively, and show the gradual closure which occurred from the lip pressure without any damage to the developing teeth. This closure by lip pressure will occur usually regardless of the width of the cleft.

are not really pleasing unless his technic includes also artistry, which here, as in portraiture, can camouflage a multitude of defects.

In the repair of the lip, an open alveolar cleft is one of the great "bugbears" but we believe this need not be so.

Plans for forcefully approximating the separated halves of the hard palate were discussed and dismissed as unnecessary in the first quarter of the nineteenth century, to be revived in the third, and to be popularized in the fourth quarter, until now the operation has come to be regarded by many as indispensable in the treatment of wide open clefts. A number of surgeons now secure a uniformly high average quality of repair of lips and palates following preliminary forceful closure of the alveolar cleft. Our own observation and experience, however, have convinced us that:

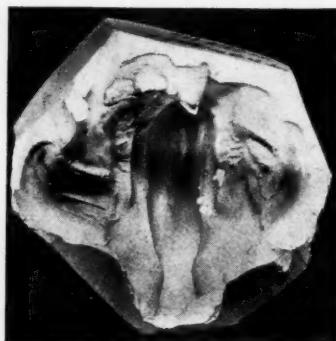


Fig. 3.—Cast of a child whose lip has been repaired over an open alveolar cleft at 2 weeks of age, yet 23 months later, it will be seen that there was a wide alveolar cleft. In the few cases we have observed in which the alveolar cleft failed to close in a reasonable time from lip pressure, approximation in this part has rapidly followed the flap operation on the palate, but in young infants it is not practical to unite the flap edges along the anterior third of the bony cleft if there is a wide alveolar separation. This does not always necessitate an extra operative sitting because this part of the palate can be closed later at the same time as the opening in front of the alveolar process is closed.

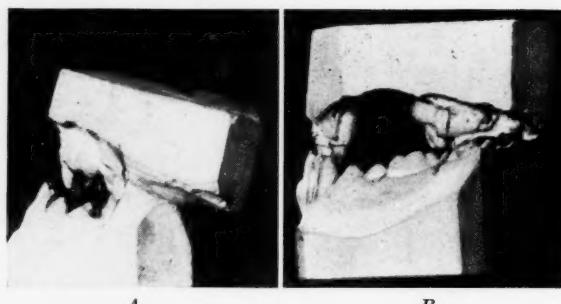


Fig. 4.—Maxillary wiring, growth distortion. *A*, Dentures of an 11-year-old child in whom a complete left-sided cleft was closed by transfixing wires at the age of 2 days. Note the lack of forward progression of the maxilla and that the teeth of the mandible are inclined lingually. *B* shows the condition at 17 years of age after 6 years of almost continuous treatment by an experienced orthodontist. This is a better orthodontic restoration than has been obtainable in a number of such extreme deformities that have come under our observation. Though such deformities are the exception rather than the rule, their possible occurrence should, we believe, taboo the practice of transfixing the infantile maxilla with wires.

1. Unless done with real skill and judgment, forceful closure of the alveolar cleft can add difficulty rather than ease to the subsequent mucoperiosteal closure of the palate cleft (Fig. 1).

2. Although the immediate results from the technic described by Brophy may be good, bad deformity of the maxilla may subsequently develop (Figs. 4 and 5). In some instances such deformities can be corrected to some extent by years of orthodontic work but in others they can only be compensated for by most exacting surgical and prosthetic procedures (Figs. 6, 7, and 8).

3. The premature loss of the deciduous, and subsequent derangement or a possible loss of permanent, teeth following the transfixing of the jaw may be the source of expense, disability, or even untimely death in the producing period of life (Fig. 9).



Fig. 5.—Maxillary wiring, profile. Profile of Fig. 4 B showing flatness of the upper lip due to the lingual position of the maxillary incisor teeth, despite the orthodontic treatment. This flatness has forced upon us the practice of replacing these displaced anterior teeth with an artificial denture in order to give proper prominence to the upper lip.



Fig. 6-A.



Fig. 6-B.



Fig. 6-C.

Fig. 6.—Maxillary wiring, profile. A shows profile of a girl who, following early bone wiring, had an extreme retraction of the maxilla. B, the dotted line shows the amount of correction that was obtained by a combination of orthodontics, the advancement of the cheeks, lip, and columella on their supporting structures, and the use of an artificial denture. All of this could have been avoided had the simpler plan of maxillary adjustment been used. C shows final correction.

4. Transfixing the jaw with wires is an unnecessary step and one that does not of itself accomplish the object for which it is advocated, namely, the better ultimate adjustment of the lip and nose (Fig. 10).

Though the illustrated records of the earlier operators are very meager, the descriptions they have left give us reason to believe that certain surgeons doing this work in the first part of the last century had developed

great skill in the planning and cutting. The results must have been compromised, however, by the use of the "harelip pins" which were dictated by the lack of anesthesia. We can today accomplish by proper undermining and careful suture of the soft parts everything that is claimed for the direct bone adjustment, and, on the average, can do better work for lack of distraction of the attention from the essential points (Fig. 11).

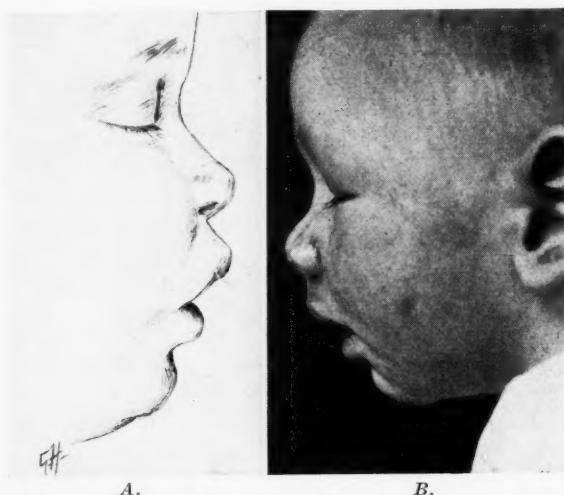


Fig. 7.—Normal prominence of the upper lip. *A*, Profile of an average infant of 2 months of age. Note how far the upper lip protrudes beyond the lip and chin. *B*, Young infant with complete right-sided cleft of the upper lip and palate, recently repaired over a wide-open bony cleft without any attempt immediately to replace the premaxilla, thus retaining approximately the normal relationship of the upper lip to the lower lip and chin for this age.

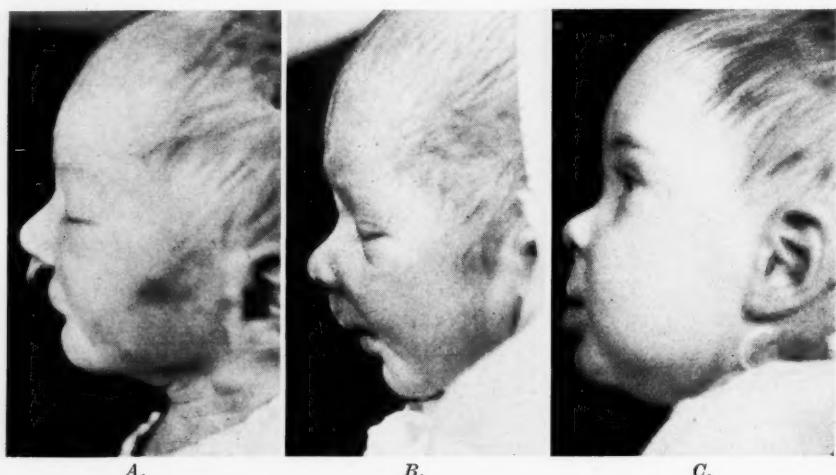


Fig. 8.—Normal prominence of the upper lip. *A* shows the prominence of the midportion of the lip in a 12-hour-old baby with a complete left-sided cleft of the lip and palate. *B* shows this prominence persisting 12 days after the repair of the lip over the open bony cleft. In *C* note the amount of retraction of the upper lip that has occurred during 9 months' subsequent development. If, at the primary operation on a young infant, the upper lip is not given its natural prominence at this age, in subsequent growth the upper lip is apt to become very much retracted.

#### LATERAL DISPLACEMENT OF NOSE, SPREAD NOSTRIL

In a complete cleft of the lip and palate, the lateral deviation of the nose is, no doubt, due partly to the maxillary, and, with it the premaxillary, dis-

placement, but uniformly there will be almost as much nasal displacement with a complete cleft of the lip and an intact alveolus (Fig. 12).

The nasal deviation is due mostly to an actual change in the relation of the soft tissue and cartilages to the bone and comparatively little to the bony displacement (Fig. 12). Therefore, it is not to be expected that shifting of the bone by itself will restore either the soft tissues or the cartilages to their

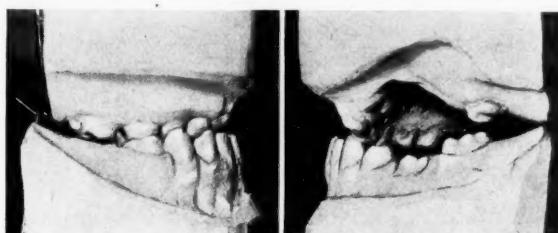


Fig. 9.—Maxillary wiring, tooth destruction. Shows an average amount of retraction of the maxilla following early forceful closure of the cleft by bone wiring, but also note the loss of the teeth on the cleft side with probable destruction of the germs of the corresponding permanent teeth.

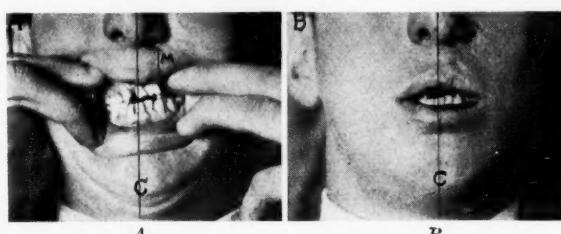


Fig. 10.—Maxillary wiring, failure of accomplishment. *A*, The midline of the premaxilla indicated by the line *M* has been brought past the midline of the face *C* in a complete left-sided cleft by a bone wiring operation done in early infancy. *B*, Note that in spite of this over-correction of the original maxillo-premaxillary displacement, the base of the columella of the nose remains drawn over to the right. This is just one demonstration of the fact that the distortion of the nose in a single one-sided cleft of the lip is but little dependent upon the interrelationship of the underlying bones. See also Figs. 11, 12, and 13.



Fig. 11.—Repair of lip over open alveolar cleft. *A* shows the characteristic external deformity of the soft parts in the presence of a complete single cleft of the lip and palate. *B* shows the replacement that can be made over the wide-open bony cleft. Note that the nostrils, columella, and tip of the nose are approximately symmetrical to the midline of the face. See Figs. 12, 13, 14, and 15.

proper position (Fig. 10). On the other hand, with sufficient undermining, these soft tissues can be shifted far enough to compensate for both the soft tissue and the bony displacement, but this undermining must be almost as extensive on the noncleft side as on the cleft side (Figs. 14 and 15). This is

a story of "To have and" also "to hold," and unless certain adjustments are made and maintained, the nose will continue to deviate with subsequent growth.



Fig. 12.—Nasal displacement. This cleft of the lip over an intact alveolus shows the characteristic spreading of the nostril and the displacement of the nose and columella to the opposite side.

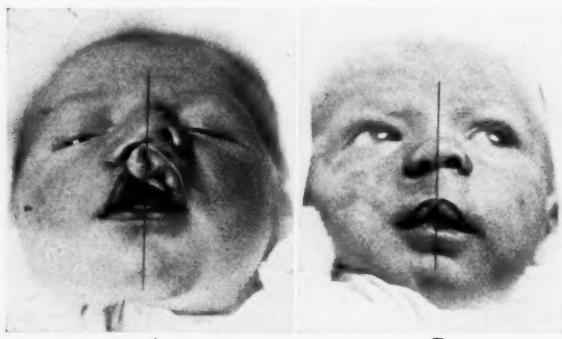


Fig. 13.—Nasal displacement. *A* shows little displacement of the nose in the presence of a wide-open cleft than was shown in Fig. 12, where the alveolus was intact. *B* shows repair of the lip and restoration of the nose to the midline without changing the relation of the sides of the bony cleft.

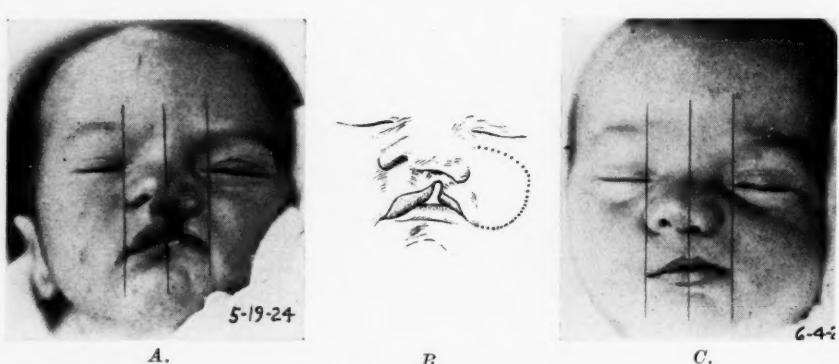


Fig. 14.—Unilateral undermining. *A* shows the displacement in a typical partial cleft of the lip with no bony cleft. Note that the transverse slit of the mouth is about symmetrical to the midline of the face but that the cartilaginous part of the nose has drifted somewhat to the right, that is, away from the lip cleft. The dotted line in the cheek in the drawing indicates the extent of the undermining that was done in this case which was operated upon some years ago. *B*, In this picture, the immediate postoperative result, it will be seen by the vertical lines that the malrelationship of the lower part of the nose to the mouth was not corrected by this operation.

To maintain the position of the bridge during the growing period, it is essential not only to bring the nose approximately to the midline but also to

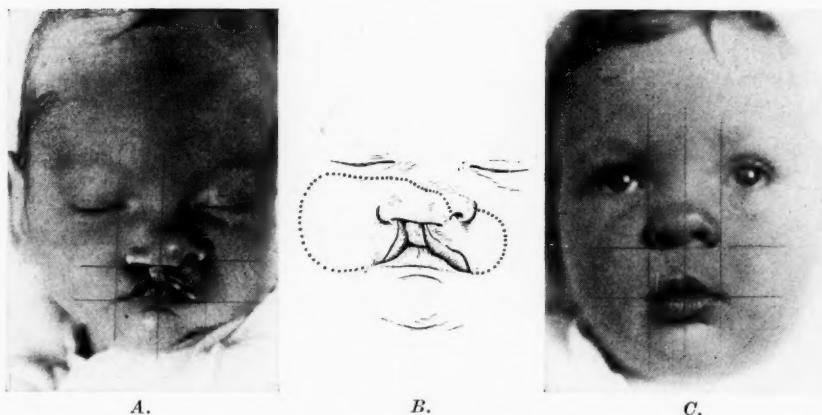


Fig. 15.—Bilateral undermining. *A* shows a child with a complete right-sided cleft of the lip and an open cleft in the alveolar process, with somewhat more nasal distortion than was present in Fig. 14. The dotted lines in the drawing show the amount of undermining in this, a more recent case. In *B* it will be seen that with bilateral undermining of the soft tissues, the nose has been brought into proper relationship with the mouth and to the midline.

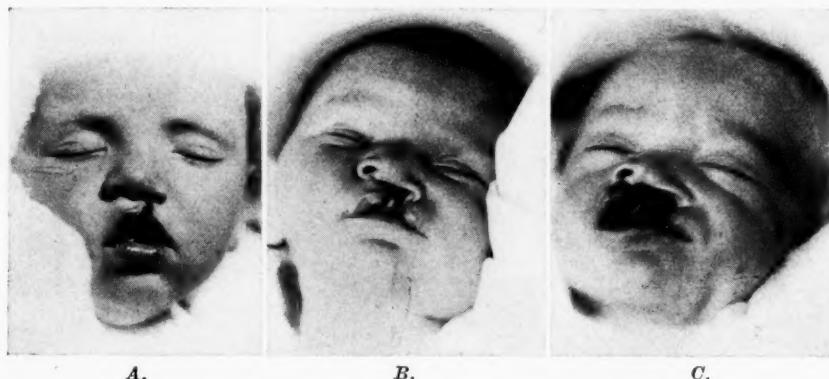


Fig. 16.—Obliquity of the nose. These three young infants show the varying amounts of obliquity of the nose which, in each, is somewhat proportionate to the width of the cleft. See Fig. 17.

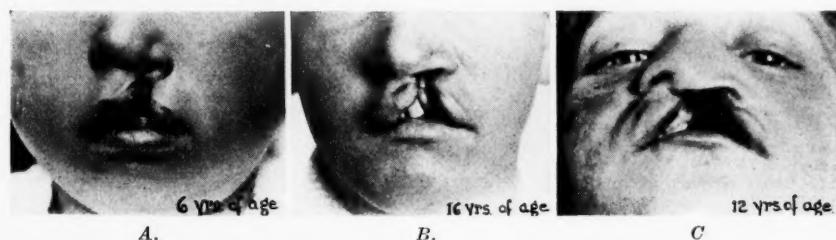


Fig. 17.—Obliquity of the nose. Shows pictures of older children with about the same width of cleft as the three babies in Fig. 16, and from this it will be seen that growth by itself, in the presence of an uncorrected cleft, has no tendency to correct the obliquity of the nose.

restore the normal relation of the labial end of the columella to the labial end of the ala. To accomplish this latter, the nostrils must be symmetrical, for the tip of the nose is composed of the walls of the nostrils. Simply narrowing the transverse diameter of the floor of the vestibule without restoring its vertical height might, as far as we know, maintain the central position of the bridge but will not correct the lateral flattening (Fig. 22). These are very positive statements dealing with a very complex matter, but, over a



**Fig. 18.**—Obliquity of the nose. Shows a young baby with a fairly wide cleft and with typical obliquity of the nose, which latter is almost completely corrected by the operation that closed the cleft. *B* taken 12 days after operation. *C* shows the condition a year later in which the new position of the nose has been well maintained. Note that in both *B* and *C* there is a slight droop of the inner end of the ala on the cleft side not corrected by the operation, but this defect has no tendency to compromise the position of the nose as a whole.



**Fig. 19.**—*A* shows a 16-year-old boy with a complete cleft of the lip and palate, which had not been operated upon. The pencil line shows the midline of the face from which it will be seen that the nasal deviation also involves the bony bridge. *B* shows the condition about 3 months later. Comparing the nose with the penciled midline in this picture, it will be seen that the position of the bony bridge was not corrected by the operation and that the stiffness of the deviated cartilaginous septum has prevented the base of the columella from being brought to a symmetrical position. From now on it is probable that with any further growth of the face these deviations will decrease rather than increase.

long period of time, we have made a great many observations that lead us to believe that these statements are correct in the majority of cases. Of one thing, however, we are even more sure: there is no 100 per cent perfection about any of it (Figs. 16, 17, 18, 19, and 20).

In a single cleft of the lip, the long axis of the nostril on the cleft side is more transverse than that of its fellow, the nostril as a whole is somewhat

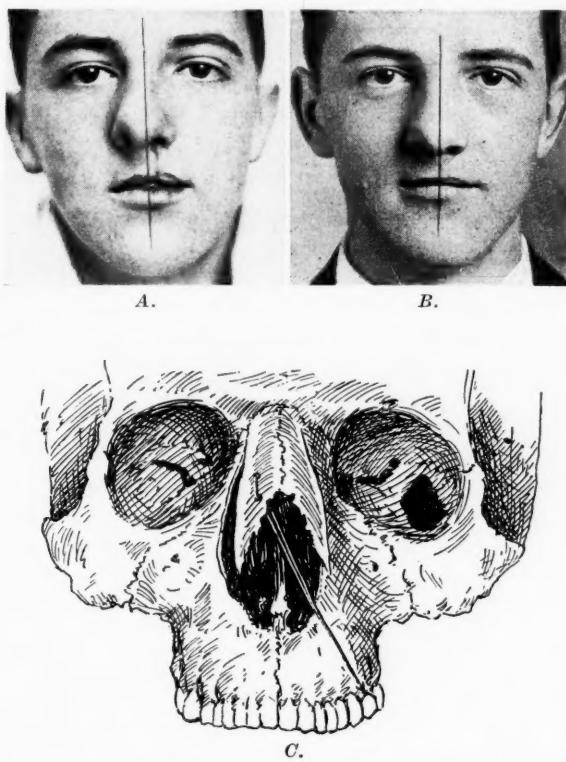


Fig. 20.—Obliquity of the nose. *A* shows a boy approximately the same age as the one shown in Fig. 19, but on whom an average closure of the cleft had been done in early infancy. As is very commonly the case, the proper relationship of the point of the ala to the base of the columella was not restored at this operation and, therefore, the deviation of the nose continued until it involved the bone as well as the soft parts. In this instance, the correction obtainable by readjusting the soft tissues would not have given complete satisfaction—therefore, the nasal bones and the lower end of the septum were mobilized and held in position by wires passed through the tissues and attached to the teeth. The drawing is taken from "Surgery and Diseases of the Mouth and Jaws," page 239. *B* shows the final result in which the position of the nose as can be seen in the photograph, is not quite symmetrical, but on the patient this is hardly discernible.

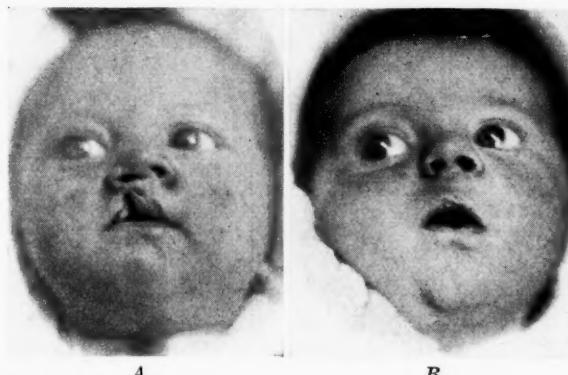


Fig. 21.—Obliquity of the nose. *A* shows flattening of the nostril which ordinarily occurs in the single partial cleft of the lip. For some reason in repairing this case instead of rotating the nostril into proper relation with its fellow, an excess was removed from the floor which gave the small nostril shown in *B*.

posterior to its fellow, and the nose is correspondingly flattened on that side (Figs. 16 and 17).

To correct these nostril distortions, it is necessary, first, to mobilize all malrelated structures with the least amount of external scar; second, to draw them into the most natural form and position attainable; third, to fix them by suture until healing has occurred.

#### TECHNIC OF OPERATION

Of a number of different plans that have been described for correcting the harelip, a few have gained wide acceptance. Each provides for the repair of an open cleft in the floor of the nostril, but none that we know of goes far enough to give the best attainable nasal adjustment. This does not imply that our predecessors did not know how to do this, but we could find no description of a systematic plan recorded. We have, therefore, been led

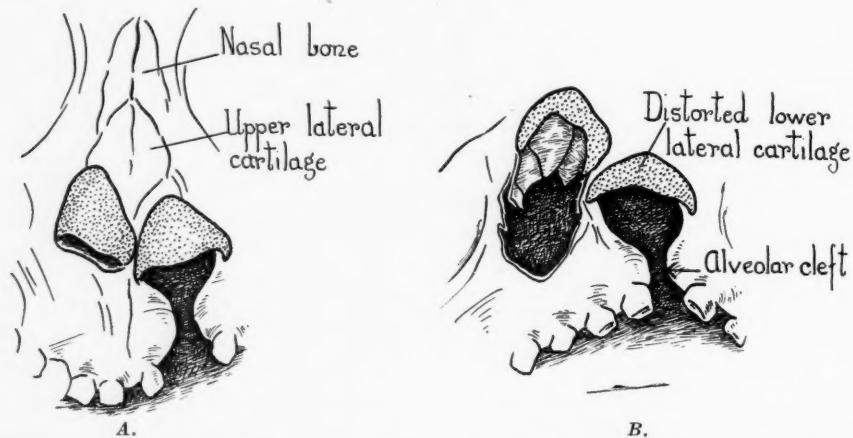


Fig. 22.—Nasal distortion. These two figures are an attempt to illustrate semidiagrammatically the changes in shape and position of the lower lateral cartilage in a complete left-sided cleft of the lip and palate. There is always some distortion of this cartilage in almost every lip cleft; it is greater in proportion to the extent and width of the cleft (see Figs. 16 and 17) and becomes accentuated with growth in the uncorrected case. The outer surface of each cartilage is here shown in stipple, the cleft in the bone and the nasal fossae are shown black. Note in A that the damaged cartilage has slumped caudally, more so in its median than its outer part. In B the lateral spreading of the cartilage as it spans the cleft is more clearly shown. As the skin of the tip and ala is closely adherent to the cartilage that side of the tip and ala will be correspondingly flattened. No attempt to restore the contour of the nose will be successful that does not correct the distortion and displacement of this lower lateral cartilage.

to work out certain definite plans for dealing with tissues surrounding the deformed nostril which might be used in connection with any one of the accepted plans of lip repair.

The first step is to mark off on the lip the plan of the external skin incisions. This will outline the raw surfaces to be united by sutures. Upon the accuracy of these cuts will depend the possibilities of the ultimate result. Therefore, while they are first planned and measured off with the eye, they are checked up with fine pointed dividers and pricked in with aqueous methylene blue solution on a fine "crow quill" pen or a hypodermic needle, before any cuts are made, so that the landmarks are not obscured by the undermining and the accompanying flow of blood (Fig. 37).

After the lip incisions are outlined, it is well again to identify the pertinent points in the nasal distortion with which we are about to deal. (Compare with Fig. 22, Figs. 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 26, 27, 29, 30, 32, and 33, which show various types of nasal distortions.)

The first operative step is the mobilization by undermining of each distorted or displaced tissue. This should release the restraining tissues from their underlying bony attachments, and at this stage cartilage may have to be shifted in its relation to bone, its fellows, or the overlying skin (Fig. 23). If necessary, excision of excess tissue between the lining and covering of the flattened ala may be made at this time (Fig. 24). The next step in the



Fig. 23.—Tissue mobilization. The line of dashes indicates the mucous incisions through which the undermining is done that frees the cheek and lip tissues from the bone in a plane superficial to the periosteum. The heavy dotted line across the nose indicates an incision in the lining of the vestibule and through or above the lower lateral cartilage from which an undermining plane extends between the external skin and the lower lateral cartilage as far down as the reflexion at the free border of the ala. The coarse stippling indicates the extent of the undermining between the soft tissues and the bone. The fine stippling indicates the area of undermining between the outer surface of the lower lateral cartilage and the skin of the nose. The downward turn at the outer end of each fornix incision gives greater relaxation of the lip and is made just in front of the parotid duct opening. Along the fornix the incision is made far enough away from the bone so as to leave a sufficient full edge of mucosa to which to suture if desired.

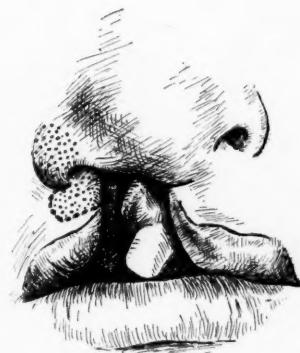


Fig. 24.—Thinning the spread ala. The stippling indicates an area from which is removed, subcutaneously, a wedge of the excess tissue that occurs between the lining and covering in the outer part of the flattened ala. Above and internal to the lip cuts indicated by dashed line, only the subcutaneous tissue needed to nourish the skin flap is retained. These steps greatly facilitate the subsequent molding of the nostril and the lip flap supplements the floor of the vestibule. (See Fig. 56.)

actual operation is the making of at least the upper part of the incisions on either side of the cleft lip. For continuity of description, however, we shall, for the present, assume that lip incisions have been made and proceed at once with the molding of the nostril.

The adjustment of the floor of the nose is made as shown in Fig. 25, care being used to prevent the distortion shown in Fig. 26 B. If necessary, the mattress sutures shown in Fig. 27 are used. Before they are put in, however, look at the patient squarely in front to see that there is no downward

droop of the inner half of the upper border of the nostril. If there is such a droop or if the inner half of the upper border of the nostril and the corresponding border of the columella make one straight line, then, in a young child, the crescentic excision (Fig. 28) is made. In an adult, the plan in Fig. 32 is used (see also Figs. 29, 30, and 31). The steps shown in Figs. 27 and 28 are carried in mind and if necessary are used and completed toward the end of the operation.

The immediate proper adjustment of the lip itself is of secondary importance to that of the nostril. No matter how poor the adjustment of the

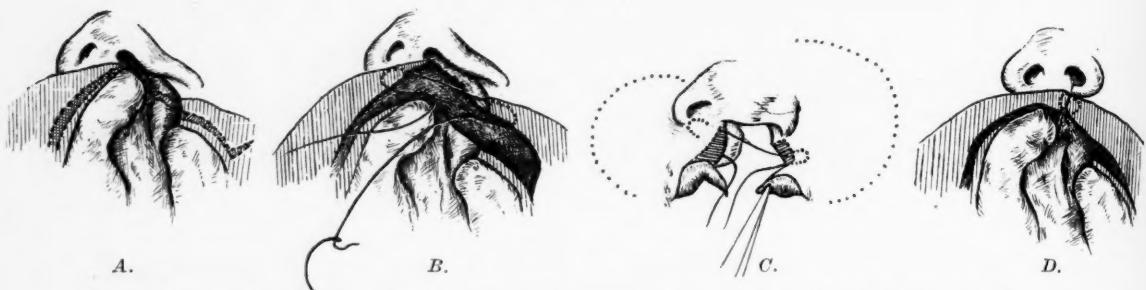


Fig. 25.—Restoration of the floor of the nose. *A* shows palate and labial fornix viewed from below with lip and cheeks cut away. The "cross hatched" area shows the line of the mucous incisions and undermining planes. *B* shows the path of this suture viewed from below and the soft tissues being drawn forward from the bone. *C* indicates the course of the chromic gut suture viewed from in front. *D* shows the reposition of the tissues that results from the drawing up and fixation of this suture. This suture should not include any derma or it may cause some hesitancy in healing. *The proper placing of this suture is essential to the proper molding of a distorted nostril.*



Fig. 26.—Nasal obstruction. *A* shows a complete cleft in which the ala is drawn out into a flat band, the lining wall being relatively the same length as the external skin covering. If this flat ala is tubed into a nostril, even after the lining is separated from the covering, the lower lateral cartilage and the skin lining will bend into and cause an obstruction in the nostril as shown in *B*. Packing the nostril with gauze and retaining the pack for some days after the operation will help correct this. Greater accuracy in distributing the lining is obtained by through-and-through mattress sutures (Fig. 27-B). Formerly, we incised the mucosa and lower lateral cartilage to lessen this deformity.

lip in infants, it will of itself pull the separated halves of the alveolar cleft into a good relationship (Figs. 2 and 3). (In older children and adults with unyielding bone formation, the separation may remain.) But a poor adjustment of the nostril will be followed by increasing deformity of the bones and of the cartilages of the nose.

The most important point in the operation on the lip is not to excise too much tissue from the lip or any at all from the lining of the nose. It should

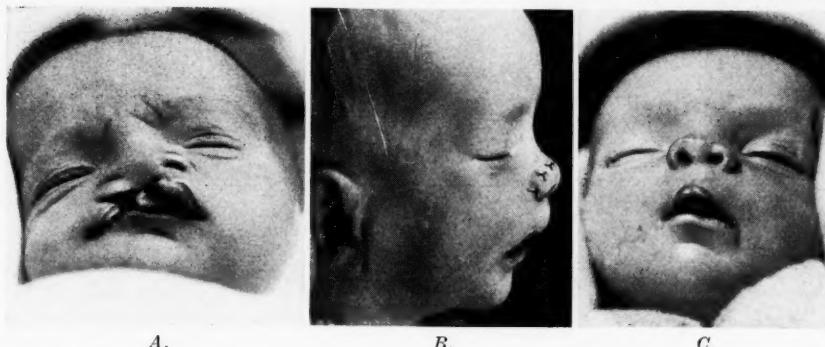


Fig. 27.—Nasal obstruction. *A* shows a baby with an alar distortion similar to that shown in Fig. 26. Besides thorough undermining of the ala, the proper relation of the lining to the covering was obtained by 2 or 3 mattress sutures tied on the external surface. *B*. This, in addition to the gauze packing, gives a much more patent nostril.



Fig. 28.—Nasal distortion. The procedures illustrated in Figs. 23, 24, 25, 26, and 27 will restore the floor of the nostril, base of the columella, and the floor of the ala in all infants and young children, but in most cases after these maneuvers have been completed there is a downward droop of the inner half of the affected nostril (see Fig. 22-*A*). In all but older children this can be corrected by removing a crescent of skin, *A*, from above this distorted part of the border and suturing the resulting defect as shown in *B*. Ordinarily, the excision goes down to, but not through, the underlying cartilage. If it has not already been done, this latter is thoroughly freed from the overlying skin by inserting a dissecting scissor into the opening before the defect is sutured. This suturing then draws the slumped cartilage up to its proper level. When indicated this crescent should be removed before the insertion of the mattress sutures shown in Fig. 27, but the latter is necessary only if the outer half of the ala has been flattened out in a straight line.



Fig. 29.—Nasal distortion. In young infants this crescentic removal may be necessary to correct a downward displacement of the cartilage shown in Fig. 22-*A*, but not the flattening shown in Fig. 22-*B*. In the case here shown, the *B* deformity shows very plainly but if viewed directly from the point, it may be seen that the *A* deformity is not present; therefore, it was not necessary to remove a crescent from above the inner half of the nostril in this infant.

be borne in mind that in wide-open clefts of the lip and floor of the nostril, part of the vestibular lining has slumped down until it appears to be on the surface of the lip, in which position it is in danger of mutilation unless the incisions have been properly planned. Removal of any of the lining causes

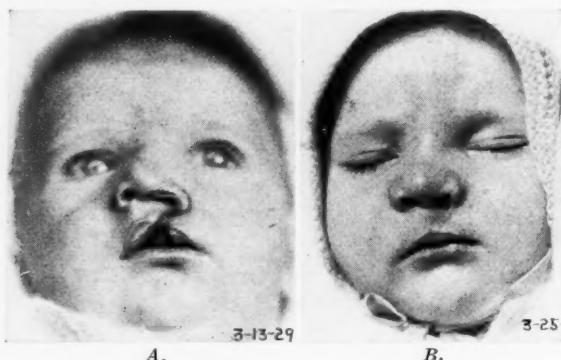


Fig. 30.—Nasal distortion. In this infant with only a partial cleft, the downward droop of the lower lateral cartilage shown in Fig. 22-*A* was quite pronounced; therefore, a crescent was removed.



Fig. 31.—Nasal distortion. In this infant there is quite a deep notch on the uncleft side at the junction of the nostril border with the columella as seen from the front. Therefore, a crescent was taken out on the uncleft side to make the two symmetrical.



Fig. 32.—Nasal distortion. In older children and adults the manipulation and suturing shown in Figs. 25 and 28 may not restore the proper relation of the 2 halves of the columella, that is, it will not correct the backward displacement of the inner half of the lower lateral cartilage (Fig. 22-*B*), and to do this it may be necessary to split the columella deeply through an external incision and substitute a triangular excision for the crescentic excision described in Fig. 28.

permanent obstruction of the nostril. Removal of an excessive amount of tissue at the cleft borders will make a lip that is a little too long from above downward or one that is excessively long and flat and shortened from side

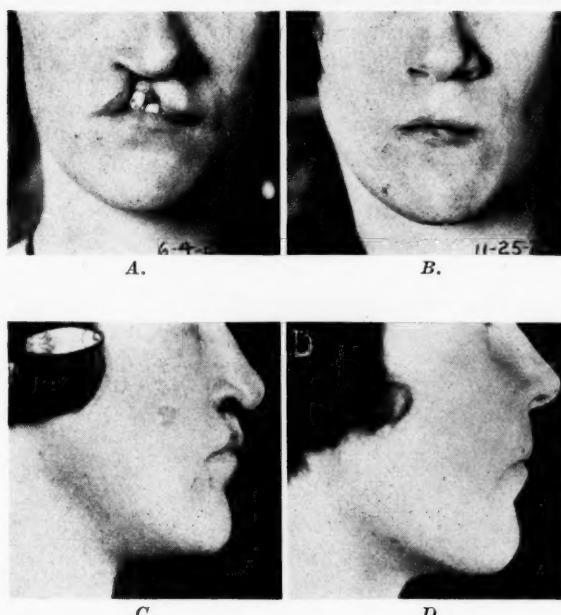


Fig. 33.—Nasal distortion. Shows a 16-year-old girl with pronounced cartilage distortion operated upon by the plan shown in Fig. 32. Viewed from the front, the border of the ala on the sound side presents a gentle concavity while on the cleft side it is of a very pronounced convexity. In this case there was very little real bony distortion of the nose, and the whole nasal distortion was corrected by the operation on the soft tissues.



Fig. 34.—Suture scars. In both these cases the greatest difficulty in the re-operation is the elimination of scars caused by badly placed sutures. In A the whole of the scarred area of the lip was excised which made an undesirable tightness from side to side. In B the two transverse scars were excised individually and the defects closed by fine skin sutures in the hope of making these less visible.



Fig. 35.—Suture scars. Objectionable suture scars can be avoided by placing all stay sutures from the mucous surface and approximating the epithelium with fine sutures that engage not more than 1 millimeter on either side and are not pulled too tight. Horsehair is apt to make better scars than silk, and the postoperative care of the wound may have something to do with the result.

to side and with an apparently protruding lower lip, the degree of deformity depending upon the amount of tissue that has been sacrificed. Bad suture scars are almost as great an evil (Figs. 34 and 35). Correction of these deformities immediately or later is difficult.

#### MIRALUT OPERATION<sup>1</sup>

We have had experience with three different operations consecutively. The Mirault type was taken up ten years ago and has been used ever since (Figs.



Fig. 36.—Mirault operation. Lip incision. We have had some difficulty in making out just what was Mirault's original operation. This picture is in Henry Hollingsworth Smith's *Operative Surgery* (1852), and is labeled "Mirault's Operation." It was upon this that the following operation was based, but the details as given in this paper were gradually worked out from our own experience. One might infer from studying the figures that the correction of the spread nostril was not part of the operation. (The usual nasal deformity is not shown.) Note also that the raw surface corresponding to  $A'C'$  in our Fig. 37 is longer than the  $C'B'$  surface. This will work out possibly more satisfactorily than our plan, in partial lip clefts, but for uniformity, we use the plan shown in Fig. 37 in almost all cases of primary operation.

The statement has been lately emphasized that using a displaced flap in the repair of a lip cleft would cause muscular distortions in the movements in the new lip; with this point in view, we have recently made a study, both directly or by means of movie films, of about 30 patients operated on by this plan, and, in none of them, after the immediate postoperative stiffness disappeared, were there any asymmetrical contortions evident.

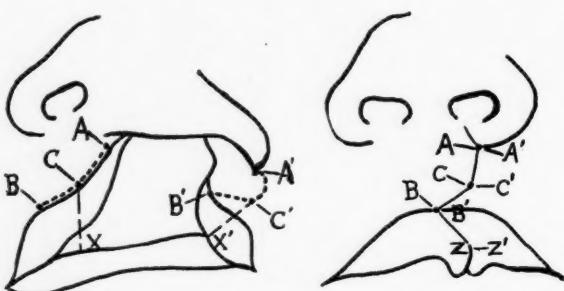


Fig. 37.—Lip incision, Mirault operation. The points  $A$ ,  $B$ , and  $C$ , and  $A'$ ,  $B'$ , and  $C'$  are the ones to be pricked in before the undermining.  $A$  is placed on the mucocutaneous junction just above the point at which a line corresponding to the oblique base of the columella would intersect the vermillion. Usually in a complete cleft of the lip, there is a very slight shallow notch in the skin at this point;  $B$  is placed just where the ridge that bounds the philtrum on the opposite side meets the mucocutaneous junction;  $C$  is a point halfway between  $A$  and  $B$ . While it was stated that the points  $A$ ,  $B$ , and  $C$  were placed in the mucocutaneous line in practice, they are put just within the skin border so that when the incisions are made, the marks will still be visible as guides in placing the sutures. In a partial cleft,  $A$  is located just on the inside of the defect of the lip instead of along the mucocutaneous junction which in this instance does not extend up this far.

On the outer side of the cleft,  $A'$  is put just beyond the point of the ala (see Figs. 38 and 42). By drawing the lip downward and outward, the exact point where the ala joins the lip will become visible. The placing of point  $C'$  requires some consideration. It should be under, and rather internal than external to  $A'$ , and at a vertical distance from the vermillion border equal to  $CX$  (see Figs. 43, 44, 45, 46, and 47).  $X$  is supposed to represent the future level of the vermillion border at this point;  $B'$  is on the mucocutaneous line at a distance from  $C'$  equal to  $BC$ . The distance from  $A'$  to  $C'$  must be equal to or less than the distance  $AC$ , but if  $A'C'$  is less than the distance  $AC$ , the cut is brought to the proper length by making it curved as shown in an exaggerated fashion in this illustration.

In suturing the lip,  $A'$  is brought to  $A'$ ,  $C'$  to  $C$ , and  $B'$  to  $B$ , but before suturing  $B'$  to  $B$ , it is necessary to make the incisions  $BZ$  and  $B'Z'$ , the method of doing which is shown in Fig. 48. Before finishing the vermillion border, the length of the skin part of the lip on either side, from the point of the ala to the mucocutaneous line, is checked up for symmetry, and, if there is a discrepancy in length, it should be corrected at this time (see Figs. 42, 43, 44, 45, and 46). No cut is made from  $A'$  to  $B'$  at this time because some or all of the skin included within the area  $A'$ ,  $C'$ ,  $B'$  can be utilized in forming the floor of the vestibule, a place that is sometimes very deficient in lining.

36 and 37). The Rose<sup>2</sup> operation was finally abandoned on account of the difficulty in controlling the tendency of the reconstructed lip to be inartistically long. The Owen operation, which is a decadent form of the Mirault, was also abandoned because the results were still more objectionable. The logic of the Mirault plan is that a flap is taken from the upper part of the lip where there is excess tissue and implanted into the lower border where tissue is most needed. As the flap must of necessity carry vermillion border, this plan would apparently be the one best suited to partial clefts with only a slight notch. However, we prefer to use this method in all cases of single cleft rather than to risk vitiating the technic by working with different operations.

In examining any case of complete single cleft of the lip in a young baby, the following points should be noted:

1. The ala is stretched into almost a straight band across the wide-open bony cleft and the floor of the nostril is difficult to identify.

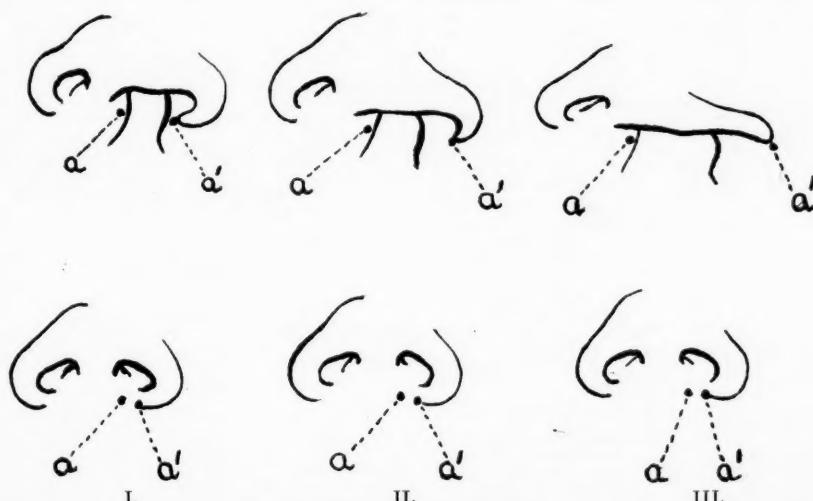


Fig. 38.—Lip incision. Point of the ala. Normally, the edge of the border of the nostril, which is the border of the ala, meets the ala labial crease at a very acute angle that points almost directly toward the midline at the level of the junction of the columella with the lip. In a very slightly spread ala, the direction of this point is not much changed, the width of the floor being due mostly to the fact that the base of the columella has drifted over to the opposite side (see I in this figure). In a moderately spread cleft, the direction of the point of the ala will be downward and somewhat inward (see II). In the young infant with a widespread complete cleft, the ala is drawn into a tight band across the cleft, and the direction of the point of the ala is downward and outward as in III. If the A' is always put in the direction of the point of the ala, then when A' is brought into conjunction with A, the ala will be pointing toward the midline which is the right direction.

2. The base of the columella lies obliquely, lower on the cleft side.
3. The outer part of the lining of the vestibule has been displaced downward and inward.
4. The vertical distance between the point of the ala and the vermillion border on the cleft side may be shorter than on the opposite side and, therefore, the mouth slit has an obliquity which is the reverse of that of the columella.
5. Though it may not be in evidence, usually enough tissue to make the nostril floor will be found lying below the base of the columella on the cleft side. This is usually supplemented by using all or part of the small triangle between lines of incision on outer side of cleft (Figs. 24 and 37).

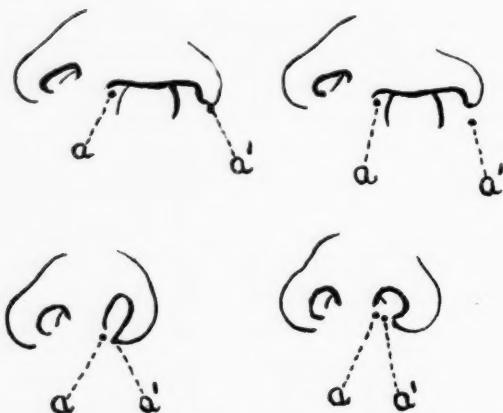


Fig. 39.—Lip incision, floor of the nostril. Very rarely it apparently occurs that there is not enough tissue to form the floor of the nostril. More tissue for the floor can be gained by moving  $A'$  a few millimeters from the point of the ala but always in the direction of its axis. However, this will impinge on tissue that, as a rule, cannot be spared, and, as a result, the angle of the mouth on that side will be drawn toward the midline. (See Fig. 47.)

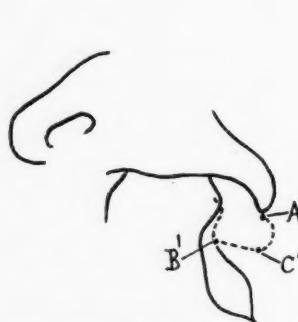


Fig. 40.

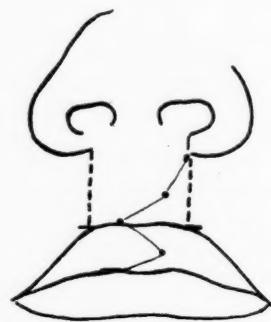


Fig. 41.

Fig. 40.—Lip incision. Vermilion border. Fig. 49 shows a central notch in the vermillion which, in our earlier experience in this type of operation, was persistently annoying. It was finally overcome by not continuing the cut  $C'B'$  directly through the vermillion border but from  $B'$  continuing upward along the dashed line shown in this figure to include all of the available vermillion as part of this flap. The manner of using this extra piece of vermillion is shown in Figs. 48 and 50.

Fig. 41.—Vertical measurements. On completion of the approximation of the skin borders of the cleft, it is well to measure with calipers the vertical length of the lip on each side as indicated by the dashed lines in this figure. If these are unequal, the cause and correction should be considered at this time.

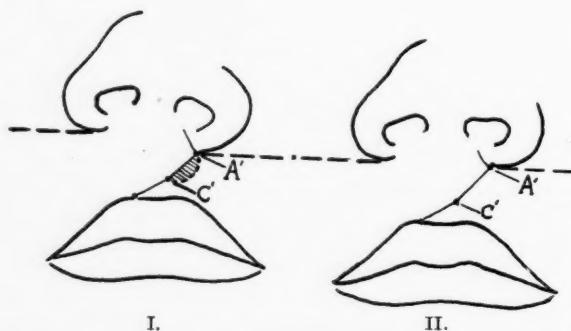


Fig. 42.—Lip incision. Locating  $A'$ . We take it for granted that the distance from the point of the ala to the mucocutaneous junction on the sound side of the lip is normal. If it is now found to be shorter on the cleft side than on the normal side, it may be that the point of the ala on the cleft side has been placed lower on that side than on the normal side (see I). By giving more concavity to the incision,  $A'C'$ ,  $A'$  can be shifted up to its proper level (see II), but it may be necessary to replace the original buried chromic catgut suture (Fig. 25). It will be noted that when the discrepancy is due to a downward displacement of the point of the ala it has not disturbed the symmetry of the border.

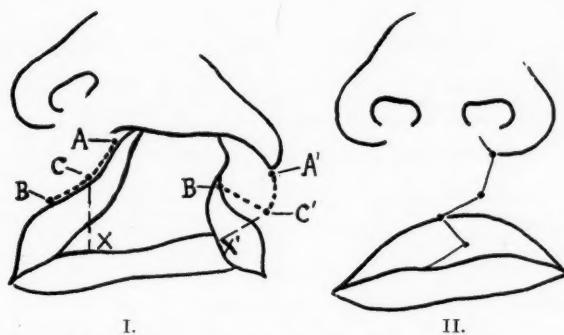


Fig. 43.—Lip incision. Locating  $C'$ . If  $A'$  has been properly placed, and the distance from the ala to the cutaneous border is short on the cleft side, it will probably be found due to having placed  $C'$  too close to the mucocutaneous border, that is,  $C'X'$  is shorter than  $CX$ , or  $A'C'$  is shorter than  $AC$ ; or both  $A'C'$  and  $C'X'$  may be short. Usually the angle of the mouth will also be found to be at a higher level than its fellow. For the correction of this, see Fig. 44.

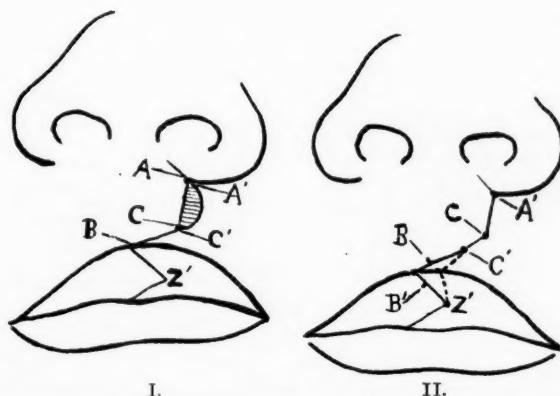


Fig. 44.—Lip incision. Point  $C'$  continued. To correct the condition depicted in Fig. 43, it is necessary to lengthen the incision  $A'C'$  by making it more concave and then suturing  $C'$  further along toward  $B$  as shown (see II) and to compensate for this, either the flaps  $C'B'Z'$  will have to be shortened as indicated in the dashed line in II or the incision  $CB$  will have to be extended toward the sound side. Shortening the flaps  $C'B'Z'$  as shown in Fig. 44 is more apt to be the correct method.

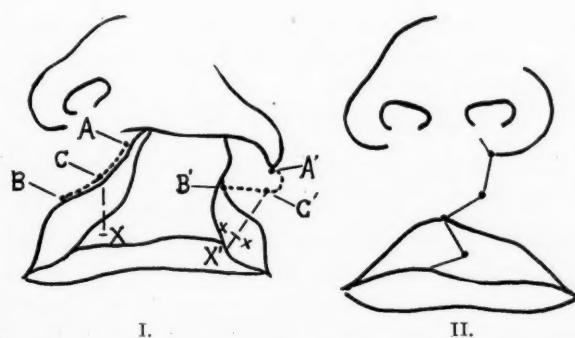


Fig. 45.—Lip incision. Point  $C'$  continued. If  $A'$  has been put at the proper level, and the distance from the point of the ala to the skin border is longer on the cleft side than it should be, as shown in II, this may be due to having made  $C'X'$  longer than  $CX$ , as shown in I (see Fig. 46).

These are all important features in the topography of the field upon which the ground plan of the new lip is to be laid out.

There is more apt to be an excess than a lack of tissue in the upper part of the lip, and, in most cases, some deficiency in the lower part of the cleft. The Mirault operation has been illustrated with the flap turned from either border of the cleft, but it is our practice always to turn the flap from the cleft side as it is easier to give symmetry to the vermillion border when the line of union is at the midline. It seems impossible, by an acceptable means, to restore the philtrum, but the lack of one bordering ridge is not very noticeable if the restoration is otherwise pleasing.

The plan of freshening shown in the illustrations (Figs. 36 and 37) usually gives a pleasing lip, but every detail is of importance; especially so is the adjusting of the mucous lining which gives the final little forward protrusion of the central part of the vermillion border that is so characteristically "baby." If the triangular piece of the lip bounded by  $A'C'B'$  is completely removed, there is a tendency to narrowing of the floor of the vestibule. This has led to the prac-

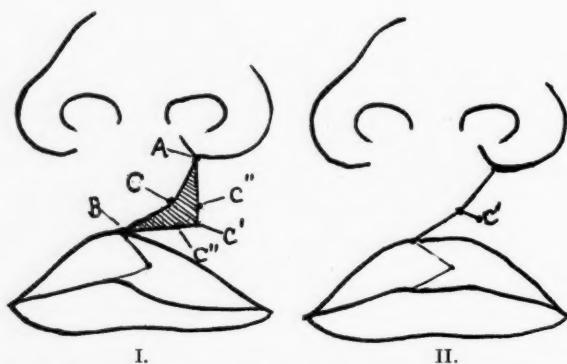


Fig. 46.—Lip incision. Point  $C'$  continued. This condition is corrected by moving  $C'$  downward and outward as shown in I, and then uniting the point  $C''$  to  $C''$  to give the adjustment shown in II. The striped area shows amount excised in doing this.

tice of making the cuts  $A'C'$ , and  $C'B'$ , and suturing the skin without detaching the resultant triangular skin flap from the vestibular floor. Later, when the floor is sutured, as much or as little of this flap can be retained as is necessary to insure ample width of the floor of the nostril.

#### PREOPERATIVE CARE

The cleft lip is corrected (over the open alveolar cleft, if such a cleft is present), as soon as possible after birth. During the first few days of life there probably remains some of the immunity to surgical shock which is necessarily present during the process of birth. Operation may be done in the first twenty-four hours. In our series no deaths have occurred from operations on twenty-four-hour-old babies. During the period of jaundice, usually from the fourth to the tenth day, the clotting time may be prolonged and operation is not done in this period. The technic of the operation at this early age is difficult, but the advantages to the baby and its mother outweigh the disadvantage to the surgeon.

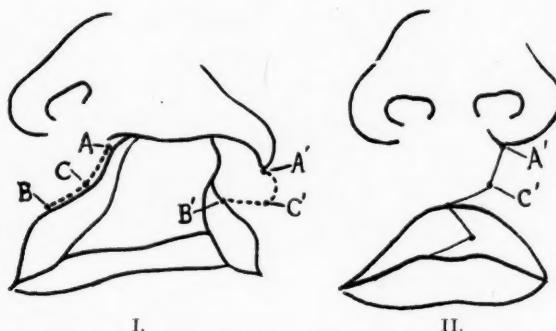


Fig. 47.—Lip incision. Point  $C'$  continued. If the outer lip fragment is deficient in size, it will be found necessary to place the point  $C'$  a little external to the position of  $A'$ , as shown in I of this figure, and, as a result, on the completion of the suturing, it will be found that the corner of the mouth on that side will be closer to the midline than its fellow. No attempt is made to correct this at the present. If it is in a young baby, there will probably be considerable spontaneous improvement with growth.

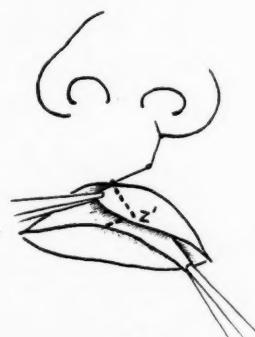


Fig. 48.



Fig. 49.

Fig. 48.—Vermilion border. To locate the incisions  $B'Z'$  the ends of the two vermillion flaps are grasped with forceps and drawn across each other as shown in Fig. 48. But these flaps are put on very little tension, and the incisions are made a little closer to the distal end of the flap than apparently is necessary and the incision goes through the mucous membrane on the anterior surface of the flap only, the distal part not being entirely detached. (See Fig. 50.)

Fig. 49.—Vermilion border. The notch shown in the center of the lip was a persistent defect in an otherwise rather satisfactory operation until we learned to conserve all of the vermillion on the outer border of the cleft (see Fig. 40).

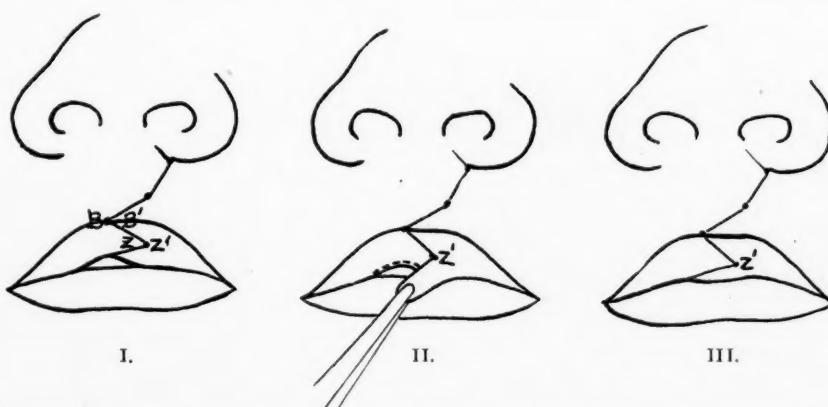


Fig. 50.—Vermilion border. I illustrates the defect that is liable to occur when the cut  $C'B'$  (Fig. 37) is carried straight across the vermillion. II shows the method of utilizing this extra bit of vermillion (see Fig. 40), and III shows the flap in place. As a matter of practice we conserve the vermillion on both sides of the cleft, and occasionally the notch is so situated that it is the flap from the  $Z$  side rather than the flap from  $Z'$  side that we finally use.

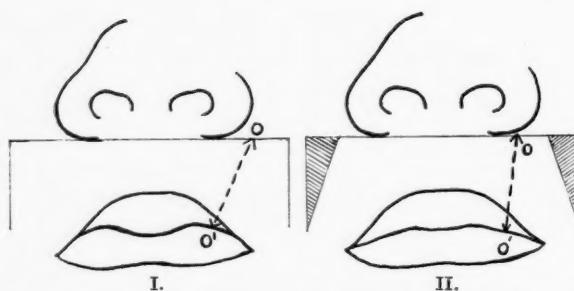


Fig. 51.—Vermilion border. Not infrequently when the lip has been thus far completed, it will be observed that the visible vermillion border is too narrow on one or both sides as shown in I. By making an incision on the mucous surface corresponding to all or a part of the line shown in I on one or both sides as may be needed and suturing the mucous lining more toward the midline as shown in II, the hidden vermillion will be let down into view. The striped areas are left raw to be later drawn together by scar. The vertical incision as shown is not always necessary; by running the transverse incision back far enough in the sulcus, the mucosa may be stretched.

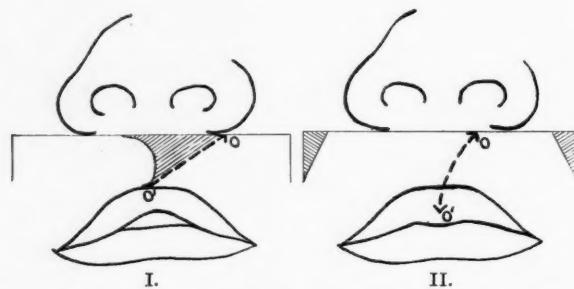


Fig. 52.—Vermilion border. A certain irregularity in the vermillion border at or near the midline can be corrected as shown in this figure. For details, see legend under Fig. 51.

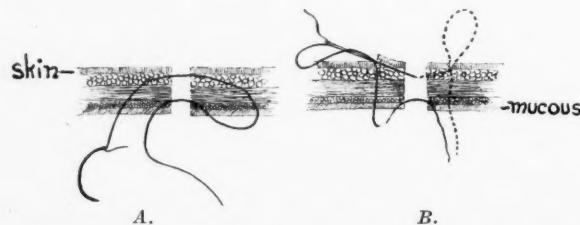


Fig. 53.—Retention sutures. The retention sutures in the lip are usually of horsehair and are put in from the mucous surface in the form of a vertical mattress that preserves the full thickness of the lip; A shows the type of suture that may be used with a moderately loose lip; B shows the suture used by Lane. It is put in with a straight needle that punctures the skin on each side and re-enters through the same puncture hole. We find this useful particularly in the double harelip. In young babies there is apt to be a suppuration on the seventh or eighth day at the site of the skin puncture, due, probably, to having engaged some of the skin. It is annoying to have such a complication occur at this time, and to avoid it we make a small stab wound through the skin at each point at which the needle is to emerge, and try to make sure that none of the derma is engaged in the loop.

Thorough physical examinations, as for all surgical patients, are necessary. Active skin infections, respiratory infections—real or suspected—and prolonged clotting or bleeding times are contraindications for operation. The patient having been accepted for operation, feeding should be allowed to within four to six hours and water to within two hours of operation. A final check on the physical condition should be made just before operation. A blood donor should be available.



Fig. 54.

Fig. 55.

Fig. 56.

Fig. 54.—Retention sutures. In babies with single cleft, two of these retention sutures are used. The position of the lower one is illustrated in this figure. The second suture is put in above the C point. In adults, we sometimes use three sutures, one higher up.

Fig. 55.—If there is a little extra fullness of the vermillion visible on one side or the other, it can be tucked up and permanently cared for with this suture, if the suture changes the relationship of the mucosa on the two sides.

Fig. 56.—Diagram explanatory of the use of the skin flap  $A'C'B$  in Figure 37 and Fig. 24. The incision has been made and the flap is retracting up into the vestibule. After the suturing of the lip has been completed, an estimate is made of the amount of lining required for the floor and the lateral bulge of the vestibule. If there appears to be a real excess, it is trimmed along the dotted line  $A'$ ,  $a'$ , and the resulting cut border is united along the free edge above  $A$ . The estimate of the amount of lining required should be very generous or the child may return later with a narrowing of the floor in the back part of the vestibule that was not evident after operation.

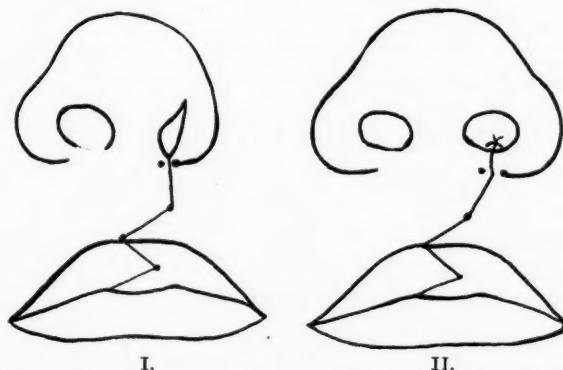


Fig. 57.—Floor of the nose, suture. The  $A-A'$  suture does not control the nostril directly and, in spite of the chromic gut suture shown in Fig. 25, that part of the vestibule lining on either side of the cleft that should form the floor will drop downward into the palate cleft, giving somewhat the appearance shown in I of this figure. One or two sutures put in the floor of the nostril with a small heavy Lane palate needle as shown in II completes the tubing of the lining and corrects most of the difficulty. Theoretically, one could put in this nostril suture more easily before putting in the  $A-A'$  suture, but  $A-A'$  demands the greater accuracy, and, therefore, comes first. It is also our practice to delay the removal of the crescent of skin from the ala (Fig. 28) until after the suturing of the floor of the nostril is completed. Only then can one tell accurately just how much of a removal is to be made (Figs. 24 and 56).

#### POSTOPERATIVE CARE

Immediately after the operation, the baby is put in the care of a special nurse and is kept in the operating room until entirely awake from the anes-

thetic and it is certain that the airway is open, that bleeding has ceased, and that shock is not present. Tap water is given by rectum to all patients, and, if necessary, saline under the skin. If much blood has been lost or shock is present or suspected in small infants, 20 cubic centimeters of the parent's whole uncitrated blood (without necessity of matching) is given under each pectoral muscle, and the areas are massaged until no lumps can be felt. If the depressed state persists, an intravenous transfusion is done.

The patient is placed on his abdomen to allow blood to run out of the mouth. The continuance of hemorrhage is closely watched for by the nurse

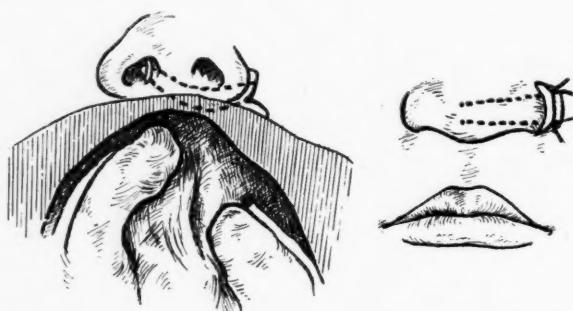


Fig. 58.—Nostril retention suture. To protect the union at the floor of the nose and the upper part of the lip during the first 12 days, the suture shown in this figure is used, usually of double horsehair. It loops over a flat lead plate (1 millimeter thick) in the sound nostril well up on the septum, and over a molded one in the ala labial fold. Before inserting this suture, the hemostatic packing is removed, and before drawing the suture taut, the reconstructed nostril is lightly packed with gauze saturated with 5 per cent xeroform ointment made up in vaseline. This keeps the nostril distended to its proper size and prevents a leakage of serum from the nostril onto the suture line which latter is to be kept absolutely clean and free from clots.

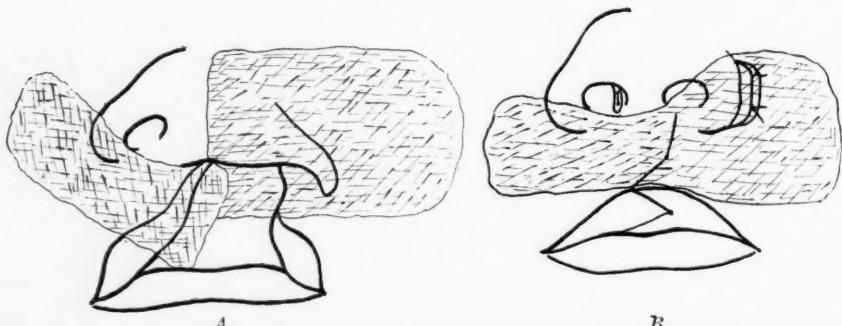


Fig. 59.—A, Hemostatic packing. When the undermining incisions are made, no attempt is made to catch the bleeders, except possibly in adults, but folded gauze is inserted into the undermining planes and pressure is applied from the outside until the active bleeding is controlled. Unless the baby should be in bad condition, these packs are removed before the lead plate suture shown in Fig. 58 is inserted, and are reapplied after this. The approximate position of these packs is shown during and after the operation.

and surgeon. A catgut stitch, which is put through the tongue at the start of the operation, is left in and gives a good sure way of maintaining control of the tongue, and, therefore, the airway, while the patient is waking. This stitch is left in, in infants and children, throughout the first night.

Immediate attention is given the lip. It is kept clean of blood and mucus by almost constant gentle wiping with small gauze squares soaked in a solution of equal parts of alcohol and boric solution. This is especially important

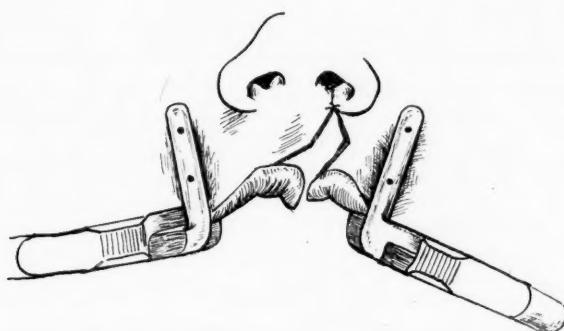


Fig. 60.—Hemostatic clamps. Shows two-angled bulldog clamps on which, to prevent them from slipping, teeth have been placed on the outer blade and two corresponding holes drilled in the inner blade. They remain in place while the skin is being sutured. The teeth puncture only the skin.

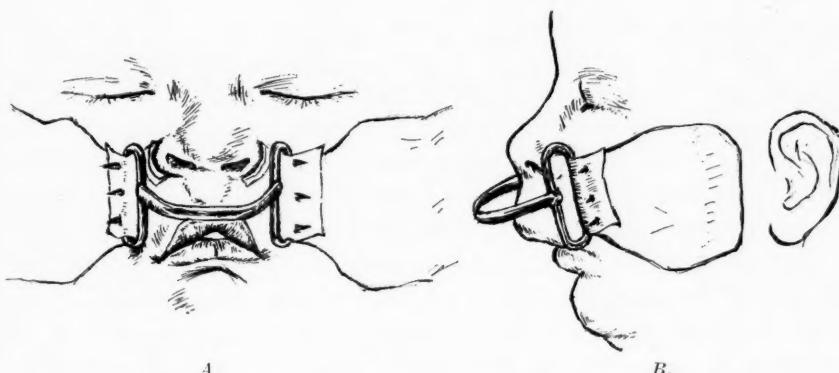


Fig. 61.—External support, the Logan clamp. Some form of external support is desirable to supplement the sutures. Many plans have been devised for doing this, but the only satisfactory one which we have encountered is illustrated. The point that gives it its pre-eminence is that Dr. Logan made it in the form of a buckle by which the slack which comes from the slipping of the adhesive plaster can be taken up as it occurs. These are put on within an hour or so after the operation.

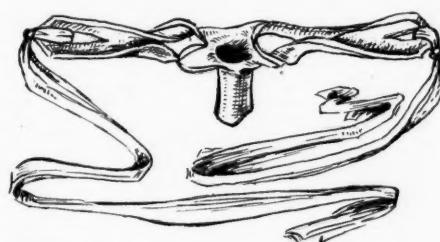


Fig. 62.—Breathing tube. Not infrequently the baby will have difficulty in breathing for some days after the reconstruction of the lip. The nostril that is not obstructed by packing is apt to be insufficient, or become obstructed by mucus, and the breathing may be obstructed either by the tongue or lips. This is quite detrimental to the baby. It is restless and loses weight. If such a baby is observed closely, it will be seen that there is some obstruction to the respiration at the mouth. If a soft rubber tube is passed into the mouth just to the oral pharynx and fastened in place, the baby will breathe comfortably, and the food can be administered with a dropper through the tube or alongside of it. The tube can be held by a suture attached to a Logan clamp, or a longer tube can be used which is split as shown in the illustration, and fastened to the cheek with adhesive plaster or around the back of the neck with tape. The tube is retained as long as necessary but is taken out of the baby's mouth and boiled at least once every twenty-four hours. If it is too long, it makes the baby gag.

during the first few hours, as the blood serum that oozes out at this time, if allowed to remain, will make a very hard crust over the suture line.

When fully awake and in satisfactory condition, the patient is returned to the ward. Airways must be kept open, and possible hemorrhage must still be watched for. Trained nurses and resident physicians are necessary for continued success in caring for these patients. Breathing tubes are frequently used (Fig. 62).

If the lip has been kept clean during the first few hours, the after-care, while simplified, must still be thorough. If crusts form, they may be loosened by wet packs or cold cream and then gently separated from the stitches. If there is superficial cellulitis or infection around the suture line, wet packs should be kept on most of the time. The quartz light is frequently used, both locally and generally.

For the first twenty-four to forty-eight hours, feeding is done with a sterile syringe with rubber tip, or with a spoon. After this, the baby may nurse the breast or use the nipple. Water by mouth is given as soon as the child will take it, and feedings are begun the same day. (In repair of palates, nipples are withheld for two weeks after operation.) The patient's hands must at all times be kept away from the mouth. For infants, a special cuff of wooden tongue depressors sewed into cloth is tied around the arm. These may be incorporated in the sleeves of the under jacket. For older children (and adults if necessary) padded anterior wooden splints are applied to prevent flexion of forearm.

The packs under the lip are removed in twenty-four hours. The skin sutures are removed in five days and the deep sutures in twelve days.

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## A REVIEW OF THE ORAL SURGERY LITERATURE FOR 1930\*

BY J. ORTON GOODSELL, D.D.S., SAGINAW, MICH.

THE object of the review of any literature is to invite the attention of the reader to various publications which might prove to be of some interest to him. It is quite apparent that no two people would agree as to the relative merits of different articles, so the reviewer may not mention some papers which others might consider of extreme importance. Likewise, it is quite impossible to review everything written for magazine publication during the past year. Therefore, no doubt, some achievements will go unheralded.

The oral surgery literature published during 1930 contained reports and résumés of nearly everything with which the average oral surgeon comes in contact. The following review is a cross-section of many articles worthy of investigation.

Asepsis is the ideal of any surgery, and we of the dental profession recognize the necessity of clean and sterile operative fields. However, we are prone to overlook many breaks in the chain of preparations and procedures necessary to the maintenance of asepsis. "Sterilization for Surgery of the Mouth," is the work of Mead<sup>1</sup> and it is the most complete article of its kind the reviewer has ever been privileged to read. The whole paper is worth reading from start to finish, and it would almost be a sacrilege to extract excerpts for emphasis. Sterilization of equipment, instruments, operative field and operator is described in detail, and it is strongly urged that every one study it.

Ultraviolet therapy has been with us long enough to have passed through the hands of the faddist. Out of the maze of claims and counterclaims have appeared numerous papers based on scientific experimentation. Luck and Peck<sup>2</sup> have attempted to determine the value of ultraviolet radiation in post-operative oral surgery. Their conclusions were that, following the removal of impacted teeth, there is a "decrease in the frequency and intensity of the infection and a shortened period of healing" with the result that after-pain is diminished if the wound is exposed to ultraviolet radiation. To the uninitiated this article is of great value because it is quite elemental in its description of the technic. To the initiated it is also of value because of the information contained.

Lambert<sup>3</sup> reviews the etiology, symptoms and treatment of shock. He gives suggestions for prevention of shock and syncope, such as elimination of the sight of instruments, rest, hypodermoclysis, complete anesthesia and the use of morphine. He outlines the accepted treatment, including the specific use of certain drugs—amyl nitrite, whisky, ammonia, etc.

\*This review does not include textbooks, but merely skims the journal publications.

The importance of foci of infection in disease comes in for its share of consideration with the customary differences of opinion. But these variances are becoming more imaginary than real. Yater,<sup>4</sup> in a paper on focal infection, discusses the relation of dentistry to medicine and maintains—it seems correctly—that the internist should be the final judge in determining whether a patient has any right to possess nonvital teeth. The difficulty that the dentist faces is the “shotgun” order all too frequently given by some medical men for the “complete removal of the teeth” without much consideration for his judgment as to necessity. However, when competent internists and equally competent dentists cooperate, the best interests of the patient must inevitably be served. Dr. Yater believes that all possible foci of infection and even seemingly uninfeeted nonvital teeth should be removed if preventive medicine is to be practiced. In spite of the pendular swing to more conservatism, there is still a certain amount of logic in his apparent radicalism.

Haden<sup>5</sup> summarizes the medical opinions on diseases traceable to infected teeth, considering only those ailments produced by focal infection. He asserts that: (a) rheumatic fever, acute, is always due to infection and comes from lymphoid tissue and seldom from the teeth; (b) middle and later life arthritis is more liable to be caused by infected teeth; (c) hypertrophic arthritis is not from teeth but atrophic arthritis may be; (d) myositis may be due to dental foci; (e) rapid improvement upon removal of infected teeth in acute arthritis is due to elimination of toxins or from allergy; (f) glomerulonephritis always is from a focus and therefore may come from teeth; (g) pyelitis probably is due to *B. coli*, but initial kidney damage may come from streptococci or staphylococci from teeth; (h) nephrosis or diffuse nephritis may be from oral foci; (i) acute endocarditis is always due to foci of infection, maybe teeth; (j) myocarditis from rheumatic fever may receive its initial contamination from dental foci; (k) acute phlebitis and arteritis may be caused by dental infection; (l) focal infection plays a definite part in duodenal ulcers; (m) chronic ulcerative colitis may come from focal infections; (n) oral sepsis has a very definite place as a factor in the cause of many eye diseases; (o) pernicious anemia is probably not caused by focal infection; (p) neuritis of various types may be produced by dental foci. He also states that we “are often disappointed in the results obtained by the removal of foci of infection in the treatment of disease even of proved metastatic origin” and pleads for the elimination of all possible foci before secondary infections occur.

Coolidge<sup>6</sup> shows some very interesting postoperative photomicrographs illustrating the formation of new cementum across the dentin of a resected tooth. He shows, in the same specimen, immediate cemental deposit without dentin absorption and dentin absorption followed by new cementum. The gutta percha stump and new cementum are covered by noninflammatory fibrous tissue. He takes the position that only the unsuccessful cases are ever sectioned for examination because of the patient’s unwillingness to lose the good tooth—and for that reason we are likely to be overwhelmed by only the bad evidence.

For those who have difficulty in differentiating abscesses and granulomas—and for those who do not—Buchanan<sup>7</sup> offers something of particular interest. He has an excellent paper on the pathology of these conditions and describes the elements in their make-ups. He states, among other things, that granulomas are occasionally uninfected but are more liable to produce systemic disease than are abscesses. It is an article well worth reading.

Williams and Budd<sup>8</sup> introduce a novel way of retaining radium in contact with oral areas to be irradiated. A modelling compound bite is made in the desired location, following which, a groove to accommodate the radium tube is cut in the compound. Bite and tube are now tied together and the appliance is inserted in the mouth for the necessary exposure time.

Feldman<sup>9</sup> discusses, apicoectomy, alveolotomy, and the use of elevators in extraction of roots, handling his subjects in an excellent manner and showing a knowledge of the principles involved—although his technic may be at variance with that of many equally good operators.

Eman<sup>10</sup> offers a very practical and concise consideration of many of the problems in exodontia. He gives the treatment of acute alveolar abscesses, describes the extraction of teeth, illustrates the removal of root fragments and takes up the postoperative control of hemorrhage and pain. This is one of the best papers of the year in the exodontic field and contains material of use to all dentists.

Fitzgerald<sup>11</sup> takes up the treatment of acute osteomyelitis of the jaw. He insists upon regular, copious irrigations, incision and drainage, caution in curettage and outlines a diet consisting of compound calcium, cod liver oil, milk, oranges and no sweets, chocolate or alkalies.

Dorrance's clinics<sup>12</sup> continue in 1930. He illustrates a method of locating foreign bodies in the tongue, describes the removal of a retention cyst in the lip, and shows two cases in which the lingual nerve has been severed during the removal of mandibular third molars. He urges extreme caution while working in the region lingual to the mandibular third molars, as the tongue anesthesia produced is very annoying and sometimes causes neuralgia.

Ivy and Curtis<sup>13</sup> show a method of reducing anteriorly dislocated maxillary fractures. They use a Scogin headcap for wire attachment and fasten this to a reverse Kingsley splint by means of heavy rubber bands. The continual pressure produced a complete reduction in ten days.

Blair<sup>14</sup> illustrates some very fine work in the treatment of ankylosis of the mandible. He gives the classification of types and makes many suggestions in diagnosis and operation, stating that: (a) scar bands should be replaced by skin-bearing flaps; (b) it is better to remove almost all of the ramus rather than to try to reconstruct the joint; (c) the condyle is essential to the normal *growth and development* of the mandible but neither condyle is essential to useful function; (d) after the joint is freed, the affected side of the mandible should be dragged forward and held in position until the tendency to recede is overcome (8 to 12 or more weeks); (e) in unilateral ankylosis it may be necessary to section the opposite ramus to get the best attainable position; (f) the receding chin can be built out by means of a costal cartilage implant; (g) large resection of the ramus is permissible in single

resection, but the coronoids and temporal muscles should be preserved in double resections; (h) permanent open-bite is the result of double condylar resection without interdental fixation. This is one of the most inclusive and instructive papers on ankylosis that it has ever been my privilege to read, and I most heartily invite attention to it.

Lyons<sup>15</sup> presents a paper on the fundamentals of cleft palate surgery and makes a plea for an adequate understanding of the exact anatomy involved. He emphasizes the restoration of function as the most important ideal of cleft palate surgery and declares that research work is being done to determine the desirability of continuing or discontinuing the employment of Brophy's silver wires and lead plates. This has been a controversial point for some time, and there is much to be said for both types of operations. There is no doubt that it would be a great thing if normal occlusion and less tense palates could be produced. He includes a description of the palatal anatomy and says that intensive postoperative speech training is of as great value in normal phonation as is the operation. Logan, in his discussion of the paper, shows some maxillary histologic sections in a six-month-old child. For those of us who supposed the permanent tooth buds to be above the unerupted deciduous teeth this work comes as a distinct shock, for the central and lateral incisor and canine permanent germs are shown *lingual* to—and on a *level* with—the corresponding deciduous teeth, while the premolar germs are *occlusal* to the deciduous molar buds.

Padgett<sup>16</sup> describes ingenious methods of repairing extremely wide palatal clefts by the use of posterior pharyngeal and pedicled skin flaps. He uses the pharyngeal flap to lengthen the soft palate and attaches it to the oral surface (of the palate) which has been rarefied by inversion of the mucosa on both sides, nasally. The flap is left attached at its pharyngeal base for an indefinite period and in some cases has not been detached. He claims definite speech improvement. The pedicled skin flap is taken from any available source and is a two-stage operation. It would seem, as Figi states in his discussion of the paper that the introduction of this inert mass would not be of sufficient benefit to supersede the employment of artificial veli—especially when one considers the operative procedure necessary for such cases. However, the writer is to be congratulated on his ability to do such splendid work, and it is hoped that his innovations will prove of extreme value to those who so sorely need such service.

Lip flaps, pedicled and otherwise, are occasionally necessary for reconstruction of facial contours. Brown<sup>17</sup> illustrates various methods for repairing external oral defects. Diagrams showing incision lines and methods of switching accompany the article.

Goodsell<sup>18</sup> illustrates various methods of retaining fractures in edentulous jaws.

Federspiel<sup>19</sup> reports the extraoral removal of three unerupted third molars—advocating the use of surgical burs for bone removal.

Austin<sup>20</sup> in going through his records, discovered forty patients who had fractured maxillary anterior roots. The majority remained vital after in-

jury and only one was sore at the time of examination. Many of the patients had no recollection of injury.

Schaefer<sup>21</sup> warns us of the danger involved in early surgery in acute infections about the upper lip, showing several cases of cavernous sinus thrombosis. While recognizing the necessity for opportune surgery one cannot help but wonder if the thrombus would not have occurred with or without surgical intervention.

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## ABSTRACT OF CURRENT LITERATURE

### NUTRITION AND PEDIATRICS

BY SAMUEL ADAMS COHEN, M.D., NEW YORK CITY

It is the purpose of this JOURNAL to review so far as possible the most important literature as it appears in English and foreign periodicals and to present it in abstract form. Authors are requested to send abstracts or reprints of their papers to the publishers.

**Studies of the Etiology of the Common Cold.** Gerald S. Shibley, Katherine C. Mills, and A. R. Dochez. *J. A. M. A.* **95**: 21, 1930.

For a number of years these investigators have been studying the problem of the etiology of the common cold, and they feel that the filter-passing anaerobes merely constitute a part of the normal flora of the upper respiratory tract and do not have a causative relation to the common cold. Furthermore, they were also led to conclude that none of the aerobic organisms such as pneumococci, streptococci, Pfeiffer's bacillus, and the like, which are commonly found in the upper respiratory tract, are of primary etiologic significance, since none of these organisms appear for the first time or in sufficiently increased numbers during the first days of the cold.

From their extensive experience in animal experimentation, these authors noted that clinically the chimpanzee is susceptible to the human type of upper respiratory infection, and (perhaps which is important for experimental purposes also) that the bacterial flora of the nose and throat of the chimpanzee is practically identical with that of man.

Of the 16 animals which were inoculated (1 c.c. of filtrate injected into each nostril) with filtered nasal washings from human beings with colds, these experts noted that after an incubation period of thirty-six to forty-eight hours seven of the animals went through the same clinical picture as human beings. The onset was characterized by lassitude, loss of appetite and the presence of a mucous nasal discharge. This was quickly followed by nasal obstruction, sneezing, coughing, and sometimes by inflammation of the pharyngeal mucosa. The mucous discharge eventually became mucopurulent, and symptoms at times lasted as long as three weeks.

On the other hand, control inoculations of nasal washings of individuals who did not have a cold had no effect on the animals even though the injected filtered nasal washings contained many of the known pathologic organisms which are frequently found in the respiratory tract.

Under carefully controlled conditions these authors also inoculated (intranasally) young adults with the washed filtrate of humans who had colds. Of the nine experiments they were successful in introducing a cold in four

instances. That is, the young adults showed infection of the conjunctivae, profuse nasal discharge, mucopurulent postnasal discharge, frank inflammation of the nasopharynx with swelling of the lymph follicles and continuous cough.

It is interesting to note that the investigators found filter-passing anaerobes present in all the filtered nasal washings used in the studies of human transmission, with both the positive and also the negative results. The varieties of anaerobes present were the same in the two instances.

As a result of these experiments, the authors hold that the contagious cold in human beings is caused by an invisible, uncultivable filtrable agent which in all likelihood belongs to the group of so-called sub-microscopic viruses, and that these seem to have the capacity to incite activity on the part of the more dangerous pathogenic organisms, as, for instance, pneumococci, streptococcus hemolyticus and Pfeiffer's bacillus that infest the upper respiratory tract.

**Rheumatic Infection in China.** John Anderson. *China M. J.* **64**: 11, 1930.

Although earlier writers on the health of the Chinese population have emphasized the fact that acute rheumatism and its congeners are rare in China, Anderson, writing from the Henry Lester Institute of Medical Research, Shanghai, believes otherwise. He states that there are a great many cases of rheumatic fever in China which are overlooked, and many others wrongly diagnosed because of the loose and easy application of the term "rheumatism."

The writer feels that rheumatic fever as we know it today is a definite clinical entity, the highest incidence being in middle Europe and the United States. The close relation existing between focal infection and rheumatic fever is generally admitted, and Anderson thinks that the question as to which is the cause and which is the sequel has not been settled. At present the etiology of rheumatic fever is not definitely known. Chorea, that is, Sydenham's chorea, which occurs usually in middle childhood and is three times more prevalent in girls than in boys, is regarded as being very closely associated with rheumatic diathesis. Muscular rheumatism is a fibrosis of the muscles and generally appears in late life, although it appears in younger individuals in the form of torticollis.

Chronic rheumatism, or simply rheumatism, is a term loosely applied to a group of conditions which show as great variety in their clinical features as in their multiple etiology. The only bond that gave union to the group was the one symptom of articular pain; and such conditions as gonorrhea, syphilis, tuberculosis and a host of other diseases, including chronic arthritis of unknown etiology, can and do give a clinical picture which is erroneously termed chronic rheumatism.

In chronic rheumatism, the etiology if not unknown is certainly obscure. Any condition which reduces the standard of health will act as a predisposing cause, and Anderson believes that the experiments on monkeys by McCarrison points to malnutrition and chronic vitamine deficiency as being a potent factor in the etiology of chronic rheumatism in China.

The diagnosis of rheumatic fever in adults is characterized by progressive painful multiple arthritis, profuse perspiration, with occasional hyperpyrexia, anemia, and with marked tendency to produce lesions in the heart.

The two pathologic manifestations which are more or less characteristic of the disease are the subcutaneous nodules found in deep fascia and tendon sheaths, and the "Aschoff body" found frequently in rheumatic cases having cardiac manifestations.

**Streptococcus Hemolyticus in the Nasopharynx of Children.** H. F. Helmholz.  
Proc. Staff Meeting Mayo Clinic 8: 3, 1931.

Helmholz reports of his studies based on cultures of nasopharyngeal swabbings taken once every two weeks on a series of 18 children for a period of almost two years. These children, whose ages ranged from two to fourteen years, lived in their respective homes. It is interesting to note that in August, 1927, all the cultures were negative for the *streptococcus hemolyticus*. The next month, September, the percentage rose to 55, and from that month until May, 1928, the percentage of positive cultures varied between 18 and 55 per cent. From July to October, 1928, the percentage ran constantly between 44 and 100 per cent.

Although there were a great many cases of scarlet fever in Rochester during the winter of 1927 and 1928 extending to the summer, Helmholz noted that there was no increase in the percentage of positive cultures of *streptococcus hemolyticus*. Incidentally during this period of observation of almost two years the 18 children had a total of 98 upper respiratory infections (or so-called colds), and this investigator noted that a definite relation between *streptococcus hemolyticus* and colds is not discernible. The author did find, however, that the presence of *streptococcus veridans* was practically constant in the nasopharynx of these children. On the other hand, of the total of 486 cultures 44 per cent were positive for *streptococcus hemolyticus* and 56 per cent were negative.

**Factors Involved in Combating the "Hunger Strike" in Children.** W. P. Lucas and H. B. Pryor. Am. J. Dis. Child. 41: 2, 1931.

These authors report their observations on 110 children who for all practical purposes are on a so-called "hunger strike." Their findings are interesting and highly instructive in dealing with this all too common symptom of persistent anorexia. In addition to their refusal to eat, many of these children are also constipated, and sometimes complain of abdominal pain and vomiting. Sixty-two of the 110 children were underweight, and forty-one of these were described as overactive and highstrung, easily fatigued and irritable.

The measurements of these children confirmed the clinical impression that the children who did not eat had a comparatively small and delicate framework. As a matter of figures, over 82 per cent of the series were classed as the linear type of child. Lucas and Pryor prescribe enforced rest for these children, such as having breakfast in bed and getting up at 10 A.M., and an additional nap from 1 to 3 P.M. and to bed again at 7 P.M. In a few cases the

children were put to bed for a period of from ten days to two weeks. The authors also confirmed the findings of other investigators who found in this asthenic type of child a delayed emptying time of the stomach, and also the amount of both free and combined hydrochloric acid to be as low as half that found in the normal child. In checking the diets of these children these physicians of San Francisco noted that the mothers concentrated or enriched the children's food by the addition of fat.

In addition to enforced rest and abdominal massage because of the distended colon which is often present, combined with oil retention enemas followed by colonic flushing with physiologic solution of normal salt solutions, these writers advocate a low residue diet in which strained fruit juices are substituted for milk.

Instead of the normal diet of 15 per cent protein, 50 to 60 per cent carbohydrates and from 25 to 35 per cent fat, Lucas and Pryor prescribe for these children a low residue diet which consists of 16 to 18 per cent protein, from 18 to 21 per cent fat and from 58 to 63 per cent carbohydrates. The total caloric intake averages from 38 to 40 calories per pound body weight.

**Observations on the Milk of New Zealand Women.** Helen Easterfield Deem. *Arch. Dis. Child.* 6: 31, 1931.

Dr. Deem observed the diurnal variation in the fat content of the milk of thirty New Zealand women, and noted among other things that there was no diurnal variation in the constituents of human milk other than fat. The highest percentage of fat was noted at 10 A.M., and the lowest percentage of fat at 6 A.M. The mean average composition of the milk was fat 4.8 per cent, sugar 7.21 per cent, protein 1.2 per cent, ash 0.22 per cent.

This investigator also noted that the feeding of a high fat diet to nursing mothers was found to increase the fat percentage in the milk, and that the feeding of a high protein diet plus vitamin B diet increased the quantity of milk.

**Fracture of the Skull in Childhood.** John T. Morrison and Miriam Roskin. *Brit. M. J.*, 1931.

Although the literature may give one the impression that basal fractures in children are unusual, Morrison and Roskin of Liverpool Children's Hospital, England, report 57 cases of fractured skull in children (the youngest of the series being one month of age) during a survey of almost two years. Twenty-four of these 57 cases were due to injuries caused by motor vehicles. The cardinal clinical symptoms were:

1. vomiting,
2. impairment of consciousness,
3. bleeding from mouth, nose or ears.

The general mortality of the 57 cases was nearly 18 per cent.

In the treatment, these English observers state that all cases of head injury should be regarded as possible cases of fracture of the skull, particu-

larly when children are suffering from shock not otherwise adequately explained. Patients with skull fracture are kept recumbent for ten to fourteen days, and mental and physical rest is continued for another week. They also state that where an open wound exists early operation is imperative after the early shock is treated. Local anesthesia is the method of choice even in small children.

In the follow-up of this series, it is interesting to note in 50 per cent of the thirty-three whom they were able to trace these authors observed that there have been departures from normal, and in view of the proportion of sequela, e.g., paralysis, impaired hearing and the like, prolonged rest after convalescence set in is urged.

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## EDITORIAL

### Report of the Meeting of the New York Society of Orthodontists

THE spring meeting of the New York Society of Orthodontists was held at the Hotel Commodore on Wednesday, March 11, 1931.

The meeting was called to order by the President, Dr. William C. Fisher. As a result of the election of officers, Dr. L. J. Porter was made President-Elect, Dr. Franklin A. Squires Secretary-Treasurer, and Dr. William C. Fisher a member of the Board of Censors. President Charles A. Spahn automatically assumes office for the year 1931-1932.

The first scientific paper of the day was presented by Dr. Fred R. Blumenthal entitled, "The Problem of Occlusions With Missing Teeth." Dr. Blumenthal made an arbitrary classification by placing certain types of cases

in different groups. The main topic of the paper was whether spaces should be retained for missing teeth, by inserting an artificial restoration, or whether the spaces should be allowed to close of their own accord or by us. The paper was discussed by Dr. Ashley E. Howes of New Rochelle.

Dr. Joseph D. Eby presented an interesting case report, "A Study of the Structures of the Face in a Case of Ankylosis—Before and After Treatment." Dr. Eby stressed the importance of function as a factor in the development and growth of bone. The mandibular incisors in this case at the time of operation were very loose. After the operation, which permitted a greater amount of function, the teeth tightened and the alveolar process showed a decided improvement as to structure.

"A Résumé of the Simon Method of Diagnosis" was presented by Dr. Martin Dewey. This paper dealt with the origin, plan and purpose of the Simon method. From a résumé of Dr. Simon's writing, one would gather that he placed greater stress upon the relation of the denture to the face and cranium as a determining factor in the plan of treatment to be followed than he placed upon the relation of the mandibular arch to the maxillary arch. Dr. Dewey showed that in the evolution and growth of the face, the most constant factor as related to jaw forms and face forms was the cusp relation of the teeth. Jaw forms and tooth forms change in different mammals, but the cusp relations remain the same. Various inconsistencies in Dr. Simon's system were shown. Dr. Dewey showed that the gnathostatic model as made by Dr. Simon and his followers to record anterior and posterior development and growth of the arches in relation to the face and cranium was not reliable. This lack of value was due to the fact that the gnathostatic model does not retain the tragus as a relatively fixed point from which to relate the eye point and the canine point. The gnathostatic model is only valuable as a record showing vertical development in relation to the eye-ear plane. The paper was discussed by Doctors Waldron, Cohen, and Trier. Doctors Waldron and Cohen stated that in their opinion, Dr. Simon was not following the "law of the canine" at the present time as it appeared in the American literature.

Dr. John W. Ross of Philadelphia presented a paper on "The Treatment of Distal Occlusion Cases; the Appliances Used and the Method Applying Them in the Various Types of These Cases." Dr. Ross presented a classification of occlusal relations based upon clinical conditions as he had found them. In this classification, Dr. Ross referred to certain types of cases presenting a normal anterior-posterior relation of the mandibular arch as related to the face and cranium where there had been a drifting of either the mandibular or maxillary molars, thereby producing an abnormal position of one molar in relation to the other that was different from the relation of the arch as a whole to the face and cranium. He showed methods of treatment for each of these types of malocclusion. The paper was discussed by Dr. Glenn H. Whitson of Brooklyn, who disagreed with Dr. Ross. Dr. Whitson in his discussion showed he was a believer in the new Angle mechanism, and consequently presented the same arguments that had been presented by these disciples of the new mechanism ever since the mechanism was brought out. He made various statements regarding bone development under the influence of the new mech-

anism, but did not present any evidence which substantiated his statements. He criticized the use of the lingual appliance for the treatment of posterior cases, regardless of the fact that the posterior occlusion cases had been treated with lingual appliances for many years. Their results are as correct anatomically as anything that has been shown which has been treated by the new mechanism. We believed it was about time the advocates of the new mechanism showed some results or changed their advertising material.

Dr. Herbert A. Pullen of Buffalo presented a paper, "Some Studies of the Molar and Premolar Teeth in Relation to Anchor Band Construction and Health of the Dental Tissues." This paper directed attention to the various anatomic forms of teeth and the necessity of making bands which adapted themselves to the anatomic forms of teeth.

A progressive clinic was given in which the following men took part: Dr. Herbert A. Pullen, Dr. Charles A. Spahn, and Dr. Sidney E. Riesner.

The clinics closed at six o'clock. There was a very large attendance at the meeting, and those present seemed to enjoy the various ideas presented by the essayists and discussors.

## NEWS AND NOTES

### The American Society of Orthodontists

#### Thirtieth Annual Meeting

The annual meeting of the American Society of Orthodontists will be held in St. Louis April 21 to 24 at the Hotel Jefferson, Twelfth and Locust Streets.

When you are purchasing your railroad tickets be sure to get a certificate because a special return rate will be made if one hundred fifty certificates are obtained.

Make your reservations early at the New Jefferson Hotel, St. Louis, the headquarters for this meeting.

Entertainment for the ladies is being planned and will be announced in the final program later.

All local dentists who are members of the American Dental Association and physicians are invited to attend these sessions by securing a badge from the Secretary at the time of meeting.

#### GOLF TOURNAMENT

Monday, April 20, the annual golf tournament of the American Society of Orthodontists will be held at the North Hills Country Club. There will be a banquet for the golfers that evening at the club. Send your club handicap to the Golf Committee, Leo Shanley, F. C. Rodgers, 4482 Washington Boulevard, St. Louis, Mo. There will be prizes for all classes which are arranged according to handicap.

#### Final Program of the St. Louis Meeting

TUESDAY, APRIL 21, 1931

##### *Morning Session*

8:00 A.M. Registration.

9:00 A.M. Meeting called to order.

Address of Welcome—Chancellor G. R. Throop, Washington University, St. Louis, Mo.

Response—Oren A. Oliver, Nashville, Tenn.

9:30 A.M. President's Address. By Harry E. Kelsey, Baltimore, Md.

10:00 A.M. Business Session

Report of Board of Censors. Paul G. Spencer, Chairman.

Report of Secretary-Treasurer—Claude R. Wood.

Report of Librarian—Abram Hoffman.

10:20 A.M. Original Research in Precious Metals Used in Orthodontia. By R. V. Williams, Metallurgist and Chemist, Buffalo, N. Y.

Discussed by Walter Ellis, Buffalo, N. Y.

11:15 A.M. A Report of Orthodontic Treatment of Deciduous Dentures. By Charles R. Baker, Evanston, Ill.

Discussed by F. A. Delabarre, Boston, Mass., and J. D. Eby, New York, N. Y.

12:15 P.M. Lunch.

*Afternoon Session*

1:15 P.M. The Relation of Malocclusion to Dental Pathology. By John A. Marshall, San Francisco, Calif.  
Discussed by W. McKim Marriott, St. Louis, Mo., and Virgil Loeb, St. Louis, Mo.

3:15 P.M. The Result of Treatment of a Mesioclusion Case for an Adult Patient (Case Report). By Frederick E. Haberle, Chicago, Ill.

3:45 P.M. Treatment of Infra-occlusion of Anterior Teeth. By A. H. Ketcham, Denver, Colo.  
Discussed by W. D. Flesher, Oklahoma City, Okla., A. W. Crosby, New Haven, Conn., and N. C. Leonard, Baltimore, Md.

7:00 P.M. Rehearsal of Clinics. Registration and assignment of space for all clinics.

7:30 to 9:30 P.M. Research Exhibit. By John A. Marshall, San Francisco, Calif. (This exhibit will be presented at this one time only.)

WEDNESDAY, APRIL 22, 1931

*Morning Session*

9:00 A.M. Business Session.  
Report of Executive Committee on Nominations for American Board of Orthodontia.

9:15 A.M. Properties of Orthodontic Wrought Gold Alloys. By N. O. Taylor, U. S. Bureau of Standards, Washington, D. C.  
Discussed by Max Kornfeld, St. Louis, Mo., and John Clauser, St. Louis, Mo.

10:15 A.M. The Maintenance of Facial Form After the Surgical Removal of Right Half of Mandible. Case Report. By George M. Anderson, Baltimore, Md.

10:45 A.M. The Dynamics of the New Angle Mechanism as Observed by a Non-Angle Man. By Ralph Waldron, Newark, N. J.  
Discussed by E. Santley Butler, New York, N. Y., and F. B. Noyes, Chicago, Ill.

12:15 P.M. Lunch.

*Afternoon Session*

1:30 P.M. Evolutionary Factors Associated With Malocclusions. By Martin Dewey, New York, N. Y.  
Discussed by Richard Summa, St. Louis, Mo., Oscar E. Busby, Dallas, Texas, and H. B. Robinson, Hutchinson, Kan.

2:45 P.M. The Treatment of a Unilateral Distocclusion, Complicated by Complete Linguoversion of Mandibular Teeth on Right Side. Case Report. By Fred Wolfsohn, San Francisco, Calif.

3:15 P.M. Four Sisters Having Congenitally Missing Teeth, and Orthodontic Treatment of the Same. Case Report. By A. B. Thompson, Des Moines, Iowa.

Business Session.  
Report of Committees.  
Report on President's Address.  
Nomination of Officers.  
Selection of next meeting place.

7:00 P.M. General Banquet. Toastmaster H. C. Pollock. Speakers: Clinton C. Howard, Atlanta, Ga., Edgar H. Keyes, St. Louis, Mo., and Clarence O. Simpson, St. Louis, Mo.  
Dentition of Eskimos of North America. Illustrated with still and moving pictures. By L. M. Waugh, New York, N. Y.

THURSDAY, APRIL 23, 1931

*Morning Session*

9:00 A.M. Business Session.

9:15 A.M. Dentition in Cleft Palate Cases. By H. L. D. Kirkham, Houston, Texas. Discussed by V. P. Blair, St. Louis, Mo., and M. N. Federspeil, Milwaukee, Wis.

10:30 A.M. Misplaced and Deeply Embedded Third Molars Necessitating Extraoral Removal. By M. N. Federspeil, Milwaukee, Wis. Discussed by George B. Winters, St. Louis, Mo.

11:15 A.M. Deep Overbite. Case Report. By H. L. Parks, Atlanta, Ga. Case With Congenitally Absent Mandibular Right First Premolar in Which the Maxillary Right First Premolar Was Extracted and the Spaces Closed Up. By E. B. Arnold, Houston, Texas.

12:15 P.M. Luncheon for Past Presidents, President, President Elect, and Secretary-Treasurers.

*Afternoon Session*

1:15 to 4 P.M. Progressive Clinics. General Chairman—J. D. McCoy, Los Angeles, Calif. Orthodontic Diagnosis. By B. E. Lischer, San Francisco, Calif.

I. Case Histories and Examination Data. By Fred Wolfsohn, San Francisco, Calif., and Harvey A. Stryker, Santa Ana, Calif.

II. Photographic Facial Reproductions. By Earl Lussier, San Francisco, Calif., and Otto W. Brandhorst, St. Louis, Mo.

III. Plaster Denture Reproductions. By Allen Scott, San Francisco, Calif., and Joseph H. Williams, St. Louis, Mo.

IV. Radiographic Examinations and Interpretations. By Clarence O. Simpson, St. Louis, Mo., and Albert H. Ketcham, Denver, Colo.

V. Differential Diagnosis of Dentofacial Deformities. By Frank M. Taylor, Pomona, Calif., and George H. Herbert, St. Louis, Mo.

Orthodontic Treatment. Chairman—Joseph D. Eby, New York, N. Y.

I. Fixed Appliances. Labial Arches: Plain Round Arch (McCoy Tubes), High Labial Arch, Pin and Tube Arch, Ribbon Arch, Angle's Edgewise Arch. Lingual Arches.

II. Removable Appliances, Hawley Retainer.

III. Molar Band Technic.

IV. Media of Attachment for Anchor Teeth.

V. Media of Attachment for Anterior Teeth: Incisor Bands, Brackets or Tubes.

VI. Applied Therapy.

## 4:00 P.M. General Clinics.

No. 1. Practical Appliances for Open-Bite Cases. By Paul Lewis, Seattle, Wash.

No. 2. Ready-Made Base for Models. By Carlton B. Mott, Asheville, N. C.

No. 3. Various Uses of the Coil Spring. By E. B. Arnold, Houston, Texas.

No. 4. Treatment of Open-Bite Cases. By Ketcham and Humphrey, Denver, Colo.

No. 5. Submerged Deciduous Molars and Their Effect on the First Permanent Molars. By A. B. Thompson, Des Moines, Iowa.

No. 6. Some Ideas on Extraoral Anchorage. By W. E. Stoft, Omaha, Neb.

No. 7. A Specific Treatment for Unilateral Distoelusion. By Charles A. Spahn, Newark, N. J.

No. 8. The Treatment of a Very Unusual Fracture and the Results Obtained With the Aid of Orthodontic Appliances. By Guy M. Gillespie, Abilene, Texas.

No. 9. Precision Instruments for Properly Soldering Buccal Tubes, Half Round Tubes, Round Tubes, and Half Round Wire. Hard Point Pliers, Nonecorrosive, Nonfusing, Nonoxidizing. Flame Intensifying Attach-

ment for Grunberg Blowpipe, Adaptable to Natural and Artificial Gas. By Russel E. Irish, Pittsburgh, Pa.

No. 10. Appliance Construction and Soldering Technic, Illustrating Adapting and Bending Wire by Heat, and Methods Used in Soldering. By Ernest N. Bach, Toledo, Ohio.

No. 11. Cast Retention Plates With Roach Clasps. By Percy Norman Williams, Tucson, Arizona.

FRIDAY, APRIL 24, 1931

*Morning Session*

9:00 A.M. Business Session.

9:15 A.M. The Treatment of a Case of Malocclusion During Pregnancy. Case Report. By Ralph Howarth, Cleveland, Ohio.

9:45 A.M. A Résumé of Radiographic Service in Orthodontics. By C. O. Simpson, St. Louis, Mo.  
Discussed by Sidney Reisner, New York, N. Y., and A. B. Brusse, Denver, Colo.

10:45 A.M. The Missing Link. Synopsis, Origin. In What Way Does It Concern the Orthodontist? In What Way Does It Concern the General Practitioner? Remedy (Illustrated). By R. C. Willett, Peoria, Ill.  
Discussed by O. W. Brandhorst, St. Louis, Mo., and R. L. Webster, Providence, R. I.

11:40 A.M. Two Distocclusion Cases. Case A, Bilateral Distocclusion With Labioversion of the Maxillary Incisors. Case B, Bilateral Distocclusion With Linguoversion of the Maxillary Incisors, Complicated With the Extreme Unilateral Linguoversion of the Mandibular Molars and Premolars. By J. E. Johnson, Louisville, Ky.

12:15 P.M. Lunch.

*Afternoon Session*

1:30 P.M. The Delineasope a Convenient Adjunct in Record Keeping. By L. M. Waugh, New York, N. Y.

2:00 P.M. Identical Twins. Case Report. H. A. Denbo, Chicago, Ill.

2:30 P.M. Tissue Changes, the Result of Tooth Movement. By L. F. Rittershafer, Ann Arbor, Mich.

3:15 P.M. Business Session.  
Closing Session.  
Installation of Officers.  
Adjournment.

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Committees Appointed for the American Society of Orthodontists Annual Convention to Be Held in St. Louis

General Arrangements Committee:

Dr. Frank C. Rodgers  
Dr. O. W. Brandhorst  
Dr. H. C. Pollock

Banquet Committee:

Dr. George Herbert  
Dr. A. C. Mogler

Golf Committee:

Dr. Leo. M. Shanley  
Dr. Frank C. Rodgers

Equipment Committee:

Dr. E. Holstine, Chairman

Committee for Ladies' Entertainment:

Dr. Leo M. Shanley, Chairman  
Dr. George Herbert.

Details pertaining to hotel arrangements should be taken up direct with Mr. Wm. Schneider, Convention Manager, Jefferson Hotel, St. Louis, Mo.

### The American Board of Orthodontia

A meeting of the American Board of Orthodontia will be held at Hotel Jefferson, St. Louis, Mo., on April 20, 1931, at 9 A.M.

Those orthodontists who desire to qualify for a certificate from the Board should secure the necessary application form from the Secretary. Attention is called to the following resolutions adopted by the Board.

Any person desiring to make application to the Board for a certificate shall have been in the exclusive practice of orthodontia for a period of not less than five years or an equivalent to be determined by the Board and based upon the following conditions.

First, an instructor in orthodontia in a school satisfactory to the Board.

Second, an associate in the office of an orthodontist whose standing is satisfactory to the Board.

It is, however, to be definitely understood that any person at the time of making application for a certificate shall be in the exclusive practice of orthodontia in his own name.

ALBERT H. KETCHAM, President,  
1232 Republic Building,  
Denver, Colo.

OREN A. OLIVER, Secretary,  
1101 Medical Arts Building,  
Nashville, Tenn.

### Sixty-Third Annual Meeting of the Dental Society of the State of New York

Hotel Pennsylvania, New York City, May 12, 13, 14, and 15, 1931

The officers and committees of the Dental Society of the State of New York with much pleasure invite the attention of dentists and guests in and outside of the state to participate in the arranged program. The program the present year has been arranged carefully along lines entirely different from those pursued in previous years.

*Opening Session*, Tuesday, May 12, 1931.

Thomas Parran, Jr., M.D., Commissioner State Dept. of Health, Albany, N. Y.

*Symposium on Economics.*

Michaelle Davis, Ph.D., Director Medical Service, Julius Rosenwald Fund, Chicago, Ill.  
George Wood Clapp, D.D.S., Editor, *Dental Digest*, New York City.

James Brady, D.D.S., Chairman, Bureau of Economics, American Dental Association, Philadelphia, Pa.

*Symposium on Prenatal Feeding.*

Wm. H. Ross, M.D., President State Medical Society, Brentwood, N. Y.

Eliot Bishop, M.D., President New York Obstetrical Society, Brooklyn, N. Y.

Roger H. Dennett, M.D., Director of Pediatrics, New York Post-Graduate Hospital, New York City.

C. P. Sherwin, M.D., Professor of Physiology, Fordham University, New York City.

*Symposium on Education.*

H. E. Friesell, D.D.S., Dean University of Pittsburgh Dental College.

M. E. Winternitz, M.D., Dean Yale University Medical School, New Haven, Conn.

*Scientific Research*—“*The Metabolism of the Dentine and Its Relation to Dental Decay.*”

Chas. Bodecker, D.D.S., Chairman, New York City.

Edmund Applebaum, D.D.S., New York City.

Herman R. Churchill, D.D.S., University of Pennsylvania, Philadelphia, Pa.

*Periodontia.*

Clayton H. Gracey, D.D.S., Detroit, Mich.

*Pulp Canal Therapy.*

A. E. Webster, D.D.S., Emeritus Dean, Dental College, University of Toronto.

*Focal Infection.*

Boyd Gardner, D.D.S., Mayo Clinic, Rochester, Minn.

*Partial Restorations (Removable).*

Herman E. S. Chayes, D.D.S., New York City.

*Exodontia for the General Practitioner.*

Armin Wald, D.D.S., New York City.

*Prosthetics.*

Charles M. McNeely, D.D.S., Brooklyn, N. Y.

*Dental Pathology.*

J. L. T. Appleton, Jr., D.D.S., University of Pennsylvania, Thos. W. Evans Inst.

*Partial Restorations.*

H. A. Maves, D.D.S., Minneapolis, Minn.

The program consists of carefully selected essays and three symposiums, all by authorities in every field of dentistry, also educational and table clinics, entertainment and scientific manufacturers' exhibits. The official program will be issued about April 20.

An extra day has been added that all in attendance may have more time to devote to essays and clinics as well as participate in other events.

Dr. F. A. Adams, 8 West 40th St., New York City, is chairman of the educational clinics committee.

Dr. John P. Hanks, 17 Park Ave., New York City, is chairman of the Exhibits Committee.

Hotel Pennsylvania is ideally located and equipped for convention purposes, and our members and guests will receive prompt and courteous attention. Make early reservations.

Passengers arriving at the New York Central Terminal or other railroad terminals are advised to take a taxi to the Pennsylvania Hotel.

We extend a cordial welcome to all members of the American Dental Association, the Canadian Dental Association, and dentists of foreign associations.

DR. ALFRED WALKER, President,  
100 West 59th Street,  
New York City.

DR. A. P. BURKHART, Secretary,  
57 East Genesee Street,  
Auburn, N. Y.

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**The Eastern Association of Graduates of the Angle School of Orthodontia**

The annual meeting of the Eastern Association of Graduates of the Angle School of Orthodontia will be held May 4 and 5, 1931, at the Vanderbilt Hotel, Park Avenue and 34th Street, New York City.

E. SANTLEY BUTLER, Secretary,  
576 Fifth Avenue,  
New York City.

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**Washington University School of Dentistry Announces Course in Exodontia**

Starting Monday, June 8, 1931, Dr. George B. Winters of St. Louis, Mo., will conduct the annual summer course in Advanced Exodontia at Washington University School of Dentistry, St. Louis, Mo.

RUSSELL G. FOBES, Registrar,  
Washington University, Dental Dept.,  
4559 Scott Avenue,  
St. Louis, Mo.

### Third International Congress of Radiology

The following questions will be discussed at the third International Congress of Radiology which will be held in Paris July 26 to 31, 1931:

- (1) Radiologic Examination of the Mucosa of the Digestive Tube.
- (2) Radiologic Examination of the Urinary Apparatus by Excretion of Opaque Substances.
- (3) Preoperative and Postoperative Treatment of Cancer of the Breast by Radiation (Recurrency and Metastases Excepted).
- (4) Radiotherapy of Inflammatory Diseases.
- (5) Diathermic Electrotherapy of Inflammatory Diseases.

At a general meeting, all sections being present, a thirty minutes' lecture will be given on each of these subjects. All congress members are invited to give the results of their experience on these questions both by special communication and during general discussion.

#### TRAVELS IN FRANCE

Congress members will benefit by a reduction of 50 per cent on the fare to and from the Congress on the French railways.

After the Congress several tours at reduced prices will be organized to different parts of France, including visits to various thermal and mineral watering places.

Particulars on the above-mentioned reduced rates on railway fares and on the tours after the Congress will be forwarded from the offices of the Congress to members who have paid their dues.

All information concerning hotel prices for the stay in Paris will also be forwarded.

The subscription fee is 300 French francs for members and 50 French francs for persons belonging to the member's family.

The summaries of the communications, not more than four hundred typewritten words, in English, French, or German, must be sent in before April 1, 1931.

All correspondence is to be addressed to the Offices of the Third International Congress of Radiology, 122 Rue La Boëtie, Paris 8ème, France.

R. LEDOUX-LEBARD, Secretary.

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### The Dental Hygienists Association of the State of New York

The Dental Hygienists Association of the State of New York will hold its eleventh annual meeting, May 12 to 15, 1931, inclusive, at the Hotel Pennsylvania, New York City.

The following speakers will take part in the program: Dr. Ira S. Wile of Mt. Sinai Hospital, of the College of the City of New York, of Hunter College, and of the School of Social Research; Dr. Van Alstyne, Supervisor of Oral Hygiene, Department of Education, Albany, N. Y.; Dr. Lois Hayden Meek, Director of Child Development Institute and Professor of Education at Columbia University.

Discussions on interesting topics have been arranged.

A cordial invitation is extended to members of the dental profession, dental hygienists and dental assistants.

EVELYN M. GUNNARSON, President,  
475 Fifth Avenue,  
New York City.

MABEL ERCKERT, Corresponding Secretary,  
18 East Forty-Eighth Street,  
New York City.

**Second International Orthodontic Congress**

The Second International Orthodontic Congress will be held in London July 20 to 24, 1931. The headquarters will be the Savoy Hotel (and not the Hotel Great Central as previously announced).

A full program of papers and demonstrations has been arranged, and a museum will be a prominent feature of the Congress.

An attractive social program for members and those accompanying them is in course of preparation.

Letters setting out the conditions under which contributions to the proceedings are invited, together with copies of the Congress rules and application forms for membership, have been sent to all known to be interested in orthodontics, and the Secretary-General (Mr. B. Maxwell Stephens, 76 Grosvenor Street, London, W. 1, England) will be glad to send all such information to anyone applying for it.

Regular membership of the Congress (cost £ 2-2-0 per member) is limited to those who are members of organizations which are component societies of the Congress.

Subscribing membership (cost £ 2-2-0 per member) is open to all persons of repute irrespective of society membership. Subscribing members have no right to vote or to hold office in the Congress.

J. H. BADCOCK, President,  
B. MAXWELL STEPHENS, Secretary General.

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**Visit the Eighth International Dental Congress in Paris, August, 1931****HYGIENE COMMISSION OF THE INTERNATIONAL DENTAL FEDERATION**

This is an explanation of the aim and method of operation of the Hygiene Commission of the International Dental Federation (H.C., F.D.I.), for the dental profession.

The Hygiene Commission particularly covers the field of study of:

1. Mouth hygiene conditions in the various countries.
2. The influence of mouth and dental diseases on health conditions at large.
3. The means of improving mouth hygiene conditions.
  - (a) By introduction and news of dental care, before, during, and after compulsory school age, for the purpose of improving mouth conditions.
  - (b) By promoting dental care and mouth hygiene among the mass of the people (adults), that due to their social economic position are deprived of this benefit.
  - (c) By inquiring how professional diseases of the teeth and mouth can be prevented.

The Hygiene Commission therefore approaches the national committees affiliated with the International Dental Federation for the purpose of collecting and getting acquainted with the most recent results of oral hygiene provisions and dental care as well as with the precautions in as many countries as possible.

The Hygiene Commission makes inquiries in many countries and is thus able, from the reports received, to spread information about oral hygiene and dental care. This information bears not only on installation, but also on the most economic application of the dental provisions for school children and adults (e.g., estimates of cost).

Furthermore, mention is made of the fact that during the annual session at Utrecht it was resolved that the Hygiene Commission should collect and widely disseminate means of enlightening the various nations about oral hygiene and dental care, so as to bring about appreciation of effective dental care as a necessity by the advancement and organization of annual exhibits.

In this way the Hygiene Commission promotes oral hygiene in all countries, organizes oral hygiene exhibitions on as many occasions as possible during the annual sessions of the International Dental Federation in the countries in which they are being held, for the

instruction of the people, and in addition it tries to have these exhibits held in the countries affiliated with the International Dental Federation. The Hygiene Commission is endeavoring to make a permanent collection which is as complete as possible.

The Hygiene Commission considers it a duty to inquire scientifically and sociologically into the causes of diseases and the means for prevention or combating them.

There are the following three subcommissions:

1. The subcommission for dental care of children.
  - (a) Infants.
  - (b) School children.
  - (c) Children past school age.
2. The subcommission for public dental care (adults).
3. The subcommission for oral hygiene investigations and International Mouth Hygiene institute.

These subcommissions are engaged in present-day problems of oral hygiene. The International Institute of Mouth Hygiene is affiliated with the Hygiene Commission.

The efforts of the Hygiene Commission of the International Dental Federation have already been successful. Under Professor Jessen's leadership the Hygiene Commission has been arousing interest in dental care in many countries.

The Hygiene Commission of the International Dental Federation has since 1925 entered into relations with the Hygiene Committee of the League of Nations through the intermediary of the Honorary President, Dr. N. M. Josephus Jitta, delegate of the Hygiene Committee of the League of Nations. This relation has been continued by a delegation from the Red Cross Commission. The Hygiene Committee of the League of Nations during the session of March 5-8, 1930, adopted the following resolution:

"The Health Committee, realizing the importance of maintaining efforts against dental diseases as vigorously as against other diseases, expresses its desire to be kept informed of the work of the International Dental Federation."

The Executive Council during the International Dental Federation's session at Brussels in 1930 charged the presidents of the Commission for External Relations (late Red Cross Commission) and of the Hygiene Commission of the International Dental Federation together to keep up those relations in the future.

We are confident that in this way governments of countries affiliated with the League of Nations will consider the aims of the Hygiene Commission of the International Dental Federation more than they have up to the present time.

VISCOUNT DE CASA AGUILAR, Chairman,  
Madrid, Spain.

GEO. VILLAIN, Secretary,  
Paris, France.

A.L.C.J. VON HASSELT, Treasurer,  
The Hague, Netherlands.

#### COMMISSION OF THE RED CROSS

The Commission which took charge of the relations with the Red Cross was organized immediately after the War. This Commission is the connecting link between the international organizations and one of the most important of the International Dental Federation, the Hygiene Commission.

At Copenhagen, in 1927, the question was raised whether the Commission of the Red Cross should be united with the Hygiene Commission of the International Dental Federation. After an important discussion in which Dr. Watry of Antwerp pleaded for the autonomy, the two Commissions worked separately, but in excellent collaboration.

The representatives of the International Dental Federation quickly obtained tangible results (if we consider the slowness of the discussion). To give but one, the Hygiene Committee of the League of Nations decided to sustain morally the aim pursued by the International Dental Federation. The Hygiene Committee has decreed that "oral sepsis" should be combated as energetically as other illnesses, and has asked that it be informed of all the work of the International Dental Federation.

The kindness with which the Hygiene Commission was met in Paris by Dr. Humbert, Director of the League of the Red Cross, allows us to hope that the National Committee of the Red Cross will in the future be more and more interested in hygiene and oral prophylaxis. The Polish Red Cross has created five dental offices, which is an example that should be followed by the other national organizations of the Red Cross.

Much more could be said about the need of giving more intensity to the action of the Hygiene Commission in connection with the Red Cross and the other international organizations. The reader who is interested can consult the work published in the Annual Report of the International Dental Federation, 1930, page 170.

"The Red Cross, Its Relations with Oral Hygiene": "We hope that the help of several colleagues, in all the different nations, will permit the Hygiene Commission in connection with the Red Cross to accomplish its task."

At the session in Brussels, 1930, the Executive Council decided to place under the charge of the Hygiene Commission the relations with the Red Cross and all the other international organizations: Hygiene Section of the League of Nations, International Labor Office, Confederation of the Intellectual Workers.

RENÉ JACCARD,  
Geneva, Switzerland.

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#### **American Society of Oral Surgeons and Exodontists**

The thirteenth annual meeting of the American Society of Oral Surgeons and Exodontists will be held in Memphis, Tenn., October 16 and 17, 1931. The Elks Hotel will be the headquarters for the meeting.

HOWARD C. MILLER, Secretary,  
55 E. Washington Street,  
Chicago, Ill.

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#### **American Dental Assistants Association**

The seventh annual meeting of the American Dental Assistants Association will be held in Memphis, Tenn., October 19 to 22, 1931.

RUTH F. ROGERS, President,  
223 W. Jackson Blvd.,  
Chicago, Ill.

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#### **Georgia State Dental Hygienist Association**

The annual meeting of the Georgia State Dental Hygienist Association will be held June 10 and 11, 1931, at the Biltmore Hotel, Atlanta, Ga.

MRS. M. W. ALMAND, JR., President.  
LOUISE HALL, Secretary.

**Notes of Interest**

Dr. W. Renz announces the removal of his office to 126 Shillito Place, Cincinnati, Ohio.

Mr. W. M. Griswold announces the removal of his office to 40 Hereford House, North Row, Park Lane, W. 1, London, England.